

MEMORANDUM

Date: 12 December 2002

To: Design/Build Teams

From: Francis Xavier Lilly, DFCM

Reference: Division of Youth Corrections
Washington County Youth Center
DFCM Project No. 02015430

Subject: **Addendum Number 3**

- 3.1. Proposers shall acknowledge receipt of this addendum by entering the Addendum number on the "PROPOSAL" which is part of the "Request for Proposals."
- 3.2. Please see the attached addendum items I-III.

IV. Utility Extensions

Item #1 For the purpose of the bid, utility lines shall be provided to within 5 feet of the building by the owner under separate contract or as a change order to this contract at a later date.

V. Subcontractors & Suppliers List

Item #1 A final subcontractor's list is not required at the time of the bid or within 24 hours of the bid as is the case with a non-design/build procurement. However, each proposal should identify their major subcontractors being used on the project. For example, mechanical, electrical, mason, which can be stated in the qualifications statement. A final subcontractors list will be required following the completion of plans and the securing of bids, however, the general contractor will be required to maintain the major subcontractor's identified earlier. These can only

be changed with approval by the director of DFCM with appropriate justification as would be the case for any listed subcontractor or supplier

End of Addendum 3



Wednesday, December 11, 2002

PROJECT:

WASHINGTON COUNTY YOUTH CENTER ARCHITECTURAL PROGRAM

Hurricane, Utah
D.F.C.M. #02015430

STAGE II – ADDENDUM NO. 3

The data included herein is issued by the Architect as a clarification and addition to the Architectural Program relative to the above project. Except as effected by data herein, all other parts of the Architectural Program shall remain in full force and effect as issued by the Architect, November 18, 2002. It shall be the sole responsibility of the proposer to appropriately disseminate this data to all concerned prior to the assigned proposal date and time. Receipt of the addendum shall be recorded by the proposer in the appropriate space on the proposal form found in the RFP.

I. ARCHITECTURAL ITEMS

Item #1 Department: _____ Support
Space: _____ 7.13 – Mechanical Equipment Room
Re: _____ Revised Room Size

It is the desire of the State of Utah to use a geothermal exchange heating/cooling system. This modification will delete the requirement for boilers and chillers and their related pumps. Modify room size as required to provide space for domestic water heater system, workshop, fire sprinkler riser, stair to the roof and various electrical panels as required. Room size can be changed from 1,000 s.f. to approx. 500 s.f.

Item #2 Re: _____ Architectural Design Criteria
Paragraph _____ Revise paragraph 4.e to read as follows:

- e. *Mechanical heat pump rooms* – have not been shown on in the preschematic drawing. They may take ground space, may be located on the concrete slabs above the cells, or may be in individual penthouses grouped together at various locations throughout the facility. Consideration for access and maintenance is critical, therefore minimum ceiling height of 6'-6" is required. If the spaces are located above cells or in penthouses, access via ships ladders, wall ladders, or through secure doorways on the roof shall be provided. Provide for the easy replace of equipment through wall openings and/or rooftop openings as equipment wears out and must be replaced. All doors including access doors and/or roof doors are to be monitored with a DPIS with a tie to the control room. Provide ample room around each individual heat pump unit for maintenance and the exchanging of parts.

"Our Success Is Measured By The Level Of Our Client's Success".

SCOTT P. EVANS – ARCHITECT & ASSOCIATES P.C.
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II. MECHANICAL ITEMS

Item #1 Re: _____ Mechanical Design Criteria

See attached amendments to the mechanical system program dated 12/10/02.

Item #2 Re: _____ Mechanical Outline Specifications

The entire mechanical outline specifications are to be replaced with that found in the attachments of this document.

Item #3 Re: _____ Appendix (new information)

Attached please find a geothermal study that was completed by the owner in anticipation of the above mechanical modifications.

III. ELECTRICAL ITEMS

Item #1 Re: _____ Prior Approvals

The following manufacturers, trade names and products are allowed to bid on a name-brand-only basis with the provision that they completely satisfy all and every requirement of the drawings, specifications and all addenda and shall conform to the design, quality and standards specified, established and required for the complete and satisfactory installation and performance of the building and all its respective parts.

<u>Item</u>	<u>Manufacturer</u>	<u>Stipulations:</u>
Closed Circuit TV	Extreme CCTV - Surveillance Systems	The program for the Washington County DYC requires surveillance cameras capable of both color and B/W exposure based on light level and automatically switch. The program does not require cameras with infrared enhancement capabilities and infrared illuminators. The equipment proposed by Extreme CCTV with the infrared enhancement capabilities and illuminators would be acceptable for this project.

SUPPLEMENTARY DRAWINGS/DOCUMENTS

**(ADD OR REPLACE THE FOLLOWING DRAWINGS/DOCUMENTS TO THE
ARCHITECTURAL PROGRAM AS INDICATED IN PREVIOUS SECTIONS)**

Amendments to the Mechanical System Program 12-10-02

Replace the heating and cooling program requirements outlined in paragraphs G,H,I and J to a Geo Exchange system as outlined below.

G. Geo Exchange Heat Pump System:

The mechanical heating and cooling system shall be geo exchange (ground source) heat pumps utilizing a Ground Loop Heat Exchanger (GLHE) for the heat sink.

The heat pumps shall be located in mechanical rooms. Mechanical rooms shall have a minimum of 6'-0" clear headroom. Units located above ceilings are not acceptable.

Fresh air shall be ducted to each heat pump. Extra attention will be paid to outside air intake placement and filtration to prevent introduction of wind blown sand and odors. Heat recovery devices will be utilized to recover energy from exhaust and relief air sources to pre condition the outside air.

1. Heat pumps:

The ground source heating and cooling units shall be reverse cycle type. Units shall be ARI 330 (ground source closed loop) performance certified and listed by a nationally recognized safety testing laboratory or agency, such as ETL Testing Laboratory or Canadian Standards Association (CSA). Ground source units shall be designed to operate with entering liquid temperature between 20 - 110 degrees Fahrenheit.

Each unit shall have a minimum COP of 3.00 in the heating mode and a minimum EER of 13.00 in the cooling mode at ARI-ISO 13256-1 GSHP conditions.

All units shall contain a sealed refrigerant circuit including a hermetic motor-compressor, bi-directional thermal expansion valve, finned tube air-to-refrigerant heat exchanger, reversing valve, coaxial tube water-to-refrigerant heat exchanger DX coil and service ports factory installed and tested. Compressors shall be high-efficiency rotary, reciprocating or scroll types designed for ground source duty and mounted on spring vibration isolators and wrapped with an acoustic blanket to minimize compressor sound. Compressor motors shall be single or three phase with internal overload protection.

A microprocessor-based controller or manufacturer's standard electromechanical controls shall be provided that communicates with a thermostat to monitor and control unit operation.

Supply and return water connection shall be 1" swivel FPT factory installed eliminating the need for back up wrenches when making field hose kit connections. The condensate connection shall be field switchable between 3/4" PVC socket or 1/2" copper sweat.

Manufacturer's Field Service: A factory-authorized service representative shall supervise installation of the heat pumps, including piping and electrical connections. The service representative shall commission each individual heat pump to insure set up is correct.

All water to air heat pumps shall be the same manufacture.

2. Pumping:

Centrifugal pumps, located in a mechanical room, shall circulate the water thru the building system and thru the GLHE. As a minimum, two pumps, each 100% redundant, shall be provided.

3. Above Ground Piping:

Piping within the building shall be standard weight black steel.

4. Under Ground Piping:

HDPE piping shall be constructed of high-density polyethylene (HDPE) 3408 to meet ASTM D 3350 cell classification No. PE345434C or PE 355434C with a UV stabilizer. Extruded pipe sizes and dimensions used in vertical boreholes shall conform to the specifications of ASTM D 3035-93, SD-11.

HDPE pipe fittings that are molded shall be manufactured to the dimensional specifications and requirements of ASTM D 2683 (for socket fusion fittings) or ASTM D 3261 (for butt/saddle fusion fittings). All fittings below ground level shall be made by IGSHPA approved thermal fusion or IGSHPA approved stab-fitting techniques.

Vertical sections of pipe shall be one piece except for "U" tube fitting(s) at the base of the loop. (U-tube assembly)

5. Ground Loop Heat Exchanger:

The ground loop heat exchanger shall be a closed vertical loop located approximately south of the building. Vertical bore holes shall be drilled and HDPE piping shall be installed in the bore holes to create the GLHE field. The bore holes shall be connected into sub fields and the supply and return lines shall be brought to a piping manifold within a pump room in the building. Underground vaults will not be allowed. Terminate the each subfield supply lines to the manifold with a regulating full opening ball valve. Terminate the return lines with a circuit setter and a full opening ball valve.

The GLHE shall be installed in accordance with all local and state codes. The National Ground Water Association "Guidelines for the Construction of Vertical Boreholes for Closed Loop Heat Pump Systems" and IGSHPA "Design and Installation Standards (1997)" shall serve as general criteria.

All vertical bore holes shall be pressure grouted completely with material specified by the manufacturer as "grout" and that is in conformance with IGSHPA standards specified in their publication, "Grouting Procedures for Ground-source Heat Pump Systems" and in accordance with all state and local requirements. Portland or cement based grouts are not acceptable.

All underground piping shall be flushed and purged.

H. Hybrid System:

Supplementary cooling may be added by the addition of a closed circuit mechanical draft cooling tower (fluid cooler). Supplementary heating may not be utilized. The GLHE must supply the entire heating requirements.

I. Future Capacity:

The GLHE/Hybrid shall be installed so that the future additions outlined in the program can be added without the need for additions to the GLHE or modifications to the building piping and pumping systems.

J. Air Distribution System:

Supply air will be ducted to each occupied space and distributed thru diffusers or registers. Security type terminal units shall be utilized in security areas. Return air will be ducted.

1. Security bars shall be provided in the ductwork as required where ducts pass thru security walls. Security bars may be constructed of ½" square steel bars, 6" on center, welded into a steel sleeve. The sleeve assembly shall be securely anchored into the security wall by welding angle iron brackets to the sleeve on all sides of the sleeve, on both sides of the wall.

K. Exhaust Systems:

In the administration/booking areas, all toilet rooms will be exhausted by roof mounted fans.

Any medical isolation rooms shall be independently exhausted.

SECTION 02700 - GEOTHERMAL LOOP HEAT EXCHANGER (GLHE)

PART 1 - GENERAL

1.1 SUMMARY

- A. Provide a complete Geothermal Loop Heat Exchanger (GLHE). The GLHE is a closed vertical loop consisting of boreholes. Connect each subfield supply and return lines to a manifold.
- B. Terminate the subfield supply lines to the manifold with a regulating full opening ball valve. Terminate the return lines with a circuit setter.

1.2 GENERAL SCOPE OF WORK

- A. The Drilling/Looping (DL) contractor shall provide a complete closed loop system in accordance with International Ground Source Heat Pump Association (IGSHPA) Design and Installation Standards (1997).
- B. The piping in the boreholes shall be 1.25" (1-1/4") High-Density Polyethylene pipe (HDPE) and the header circuits shall be as shown on the engineering drawings. All subsurface HDPE pipe must meet IGSHPA designated ASTM cell classifications and be approved by the Architect's Engineer or Owner's Representative for this project (see Part 2.2).
- C. The loop shall be flushed and purged in accordance with IGSHPA standards by the loop contractor. The water treatment contractor and loop field contractor shall coordinate their efforts.
- D. All header trenches shall be traced with locator wire and tracer tape
- E. Site shall be returned to rough grade as per drawings.
- F. Drilling methods used (rotary, air, mist, mud, etc.) are at the discretion of the DL Contractor

1.3 QUALITY ASSURANCE

- A. Unless otherwise instructed, work is to be observed by the Owner's Representative. Tests and inspection work are to meet his approval at each stage before backfilling. When public authorities require inspection and approval by them or their supervision of the work is required, their requirements shall be complied with. Work covered before inspection and approval shall be re-excavated and the cost borne by the Contractor responsible for covering the work. The National Ground Water Association "Guidelines for the Construction of Vertical Boreholes for Closed Loop Heat Pump Systems" and IGSHPA "Design and Installation Standards (1997)" shall serve as general criteria unless otherwise noted.

- B. Manufacturer(s) supplying HDPE must be regularly engaged in the manufacture of GLHE products and tools of the types, materials, and sizes required and the product supplied must be approved by IGSHPA for GLHE use.
- C. The DL or DL's representative shall be certified by IGSHPA.
- D. A resume containing credentials, applicable certifications, past experience with Ground Source technology and/or other relevant data must be submitted with the bid for this project. Experience shall be evaluated along with the job quote.

1.4 ENVIRONMENTAL

- A. Aquifers shall be protected and reported as per state and local requirements. All oils & grease and lubricants used during drilling shall be environmentally safe and of a quality that would be used when encountering groundwater.
- B. Pads, bras, or plastic sheeting shall be used under the drill rig.
- C. All fuel transfers shall be carefully monitored. Any fuel spills, leaks or drips shall be remediated immediately.
- D. Only potable water shall be used for make-up of drilling fluids and grouts.
- E. Drilling fluids and drilling fluid additives shall be environmentally safe.
- F. Disposal of the drilling fluids, cuttings and spoils shall be in accordance with local codes. Onsite disposal is acceptable if permitted by state and local codes and all products used in the drilling operation are environmentally safe.

PART 2 - PRODUCTS

2.1 DRILLING FLUIDS

- A. All drilling fluids shall comply with state and local codes and they shall be applied and used as prescribed by the manufacturer. Clays added shall be of the commercially processed type that shall meet or surpass the viscosity specification in the American Petroleum Institute "Std. 13-A for Drilling Fluid Materials".
- B. All other drilling fluid additives used shall comply with recognized industry guidelines and practices and local codes. Toxic or dangerous substances shall not be added to the drilling fluid.

2.2 PIPING

- A. Piping shall be constructed of high-density polyethylene (HDPE) 3408 to meet ASTM D 3350 cell classification No. PE345434C or PE 355434C with a UV stabilizer. Extruded pipe sizes and dimensions used in vertical boreholes shall conform to the specifications of ASTM D 3035-93, SD-11.
- B. Pipe fittings that are molded shall be manufactured to the dimensional specifications and requirements of ASTM D 2683 (for socket fusion fittings) or ASTM D 3261 (for butt/saddle fusion fittings). All fittings below ground level shall be made by IGSHPA approved thermal fusion or IGSHPA approved stab-fitting techniques.
- C. Vertical sections of pipe shall be one piece except for "U" tube fitting(s) at the base of the loop. (U-tube assembly) The U-tube assembly shall be Performance Pipe Unicoil or equivalent. U-bend pipe separators will be attached at ten-foot intervals to the U-bend assembly along with the grouting tremie as per manufacturers recommendations. The U-bend separators used to position the U-bend pipes against the borehole wall directly across from one another shall be the Geoclip brand, manufactured by GBT, Inc.
- D. Horizontal loop sections shall be marked with metallic locator tape or equivalent, as per manufacturers recommended procedures.
- E. Manifold piping shall be either HDPE as specified in 2.2.A or shall be black steel piping. Provide transition pieces as necessary between different piping material. All steel piping shall be painted with 3 coats of epoxy paint for rust protection.

2.3 GROUTING

- A. All vertical bore holes shall be pressure grouted completely with material specified by the manufacturer as "grout" and that is in conformance with IGSHPA standards specified in their publication, "Grouting Procedures for Ground-source Heat Pump Systems" and in accordance with all state and local requirements.
- B. Portland or cement based grouts are not acceptable.

PART 3 - EXECUTION

Not Applicable

END OF SECTION

SECTION 15050 - BASIC MECHANICAL MATERIALS AND METHODS

0.1 SUMMARY

A. Mechanical Materials:

1. Piping materials and installation instructions common to most piping systems.
2. Transition fittings.
3. Dielectric fittings.
4. Mechanical sleeve seals.
5. Sleeves.
6. Escutcheons.
7. Grout.
8. Mechanical demolition.
9. Equipment installation requirements common to equipment sections.
10. Painting and finishing.
11. Concrete bases.
12. Supports and anchorages.

0.2 MATERIALS

A. Transition Fittings:

1. AWWA transition couplings.
2. Plastic-to-metal transition fittings.
3. Plastic-to metal transition adaptors.
4. Plastic-to-metal transition unions.
5. Flexible transition couplings for underground nonpressure drainage piping.

B. Dielectric Fittings: Dielectric unions flanges flange kits couplings and nipples.

C. Mechanical Sleeve Seals: EPDM NBR sealing elements; plastic carbon-steel stainless-steel pressure plates.

D. Sleeves: Galvanized-steel sheet steel pipe cast iron stack sleeve fittings molded PVC PVC pipe and molded PE.

E. Escutcheons:

1. One-piece, deep pattern.
2. One-piece, cast brass.
3. Split-casting, cast brass.
4. One-piece, stamped steel.
5. Split-plate, stamped steel.

6. One-piece, floor plate.
7. Split-casting, floor plate.

END OF SECTION 15050

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SECTION 15055 - MOTORS

0.1 SUMMARY

- A. Basic requirements for factory field factory- and field-installed motors.

0.2 PRODUCTS

A. Motor Characteristics:

1. Motors 3/4 HP and Larger: Three phase.
2. Motors Smaller Than 3/4 HP: Single phase.
3. Duty: Continuous.
4. Enclosure: Open dripproof.

B. Polyphase Motors: NEMA MG 1, Design B, medium induction.

1. Efficiency: Premium.
2. Code Letter Designation:
 - a. Motors 15 HP and Larger: NEMA starting Code F or G.
 - b. Motors Smaller Than 15 HP: Manufacturer's standard starting characteristic.
3. Enclosure: Cast iron for motors 7.5 hp and larger; rolled steel for motors smaller than 7.5 hp.

C. Polyphase Motors with Additional Requirements:

1. Motors Used with Reduced-Inrush Controllers: Wiring connection matched for controller with required motor leads. Terminals in motor terminal box.
2. Motors Used with Variable Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.

D. Single-Phase Motors: Permanent-split capacitor Split-phase start, capacitor run or Capacitor start, capacitor run and shaded-pole motors (1/20 hp and smaller), to suit motor application.

END OF SECTION 15055

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SECTION 15060 - HANGERS AND SUPPORTS

0.1 SUMMARY

- A. Hangers and supports for mechanical system piping and equipment.

0.2 PERFORMANCE REQUIREMENTS

- A. Design supports for multiple pipes and equipment.
- B. Design seismic-restraint hangers and supports.

0.3 SUBMITTALS

- A. Shop Drawings.

0.4 COMPONENTS

- A. Steel pipe hangers and supports.
- B. Trapeze pipe hangers.
- C. Fiberglass pipe hangers.
- D. Metal framing systems.
- E. Fiberglass strut systems.
- F. Thermal-hanger shield inserts.
- G. Pipe Stands: Compact Low-type, single- High-type, single- High-type, multiple-Curb-mounting-type pipe stand.
- H. Pipe positioning systems.
- I. Equipment supports.

END OF SECTION 15060

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SECTION 15071 - MECHANICAL VIBRATION AND SEISMIC CONTROLS

0.1 SUMMARY

- A. Vibration isolators.
- B. Air-mounting systems.
- C. Restrained vibration isolation roof-curb rails.
- D. Seismic-restraint devices.
- E. Vibration isolation equipment bases.

0.2 SUBMITTALS

- A. Shop Drawings for Vibration Controls and Seismic Restraints: Signed and sealed by a professional engineer.

0.3 COMPONENTS

- A. Vibration Isolators:
 - 1. Elastomeric Isolator Pads: Standard neoprene.
 - 2. Elastomeric Mounts: Double-deflection type.
 - 3. Restrained Elastomeric Mounts: All directional mounting with seismic restraint; cast-ductile-iron housing.
 - 4. Spring Isolators: Freestanding, laterally stable, open-spring type.
 - 5. Restrained Spring Isolators: Freestanding, steel, open-spring type with seismic restraint.
 - 6. Housed Spring Mounts: Ductile-iron or steel housing, with integral, vertically adjustable seismic snubbers.
 - 7. Elastomeric Hangers: Double-deflection type.
 - 8. Spring Hangers: Combination coil-spring and elastomeric-insert hangers with spring and insert in compression.
 - 9. Spring Hangers with Vertical-Limit Stop: Combination coil-spring and elastomeric-insert hangers with spring and insert in compression and with vertical-limit stop.
 - 10. Thrust Limits: Combination coil-spring and elastomeric-insert hangers with spring and insert in compression and with load stop.
 - 11. Pipe Riser Resilient Support: All-directional, acoustical pipe anchor.
 - 12. Resilient pipe guides.
- B. Air-Mounting Systems:
 - 1. Air Mounts: Freestanding, single or multiple, compressed-air bellows.
 - 2. Restrained Air Mounts: Housed compressed-air bellows.

- C. Restrained Vibration Isolation Roof-Curb Rails: Factory-assembled, fully enclosed, insulated, air- and watertight curb rail; with spring isolators mounted on elastomeric isolator pads, and snubber bushings.

- D. Seismic-Restraint Devices:
 - 1. Resilient Isolation Washers and Bushings: Molded, bridge-bearing neoprene.
 - 2. Seismic Snubbers: Welded structural-steel shapes and replaceable resilient isolation washers and bushings.
 - 3. Restraining Cables: Galvanized-steel aircraft cables.
 - 4. Anchor Bolts: Seismic rated.

- E. Vibration Isolation Equipment Bases:
 - 1. Steel Base: Factory-fabricated, welded, structural-steel bases and rails.
 - 2. Inertia Base: Factory-fabricated, welded, structural-steel bases and rails ready for field-applied, cast-in-place concrete.

END OF SECTION 15071

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SECTION 15081 - DUCT INSULATION

0.1 SUMMARY

- A. Semirigid and flexible duct, plenum, and breeching insulation; insulating cements; field-applied jackets; and accessories.

0.2 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Flame-spread rating of 25, and smoke-developed rating of 50 for insulation installed indoors 75, and smoke-developed rating of 150 for insulation installed outdoors; according to ASTM E 84.
- B. Mockup of each type of duct insulation and finish.

0.3 DUCT AND PLENUM APPLICATION SCHEDULE

- A. Indoor Concealed, Round Supply- and Return-Air Ducts: Mineral-fiber board with factory-applied jacket Mineral-fiber blanket with factory-applied jacket Flexible elastomeric Closed-cell phenolic foam ; and with field-applied jacket.
- B. Indoor Exposed, Round Supply- and Return-Air Ducts: Mineral-fiber board with factory-applied jacket Mineral-fiber blanket with factory-applied jacket Flexible elastomeric Closed-cell phenolic foam ; and with field-applied jacket.
- C. Indoor Concealed, Rectangular Supply- and Return-Air Ducts: Mineral-fiber board with factory-applied jacket Mineral-fiber blanket with factory-applied jacket Flexible elastomeric Closed-cell phenolic foam ; and with field-applied jacket.
- D. Indoor Exposed, Rectangular Supply- and Return-Air Ducts: Mineral-fiber board with factory-applied jacket Mineral-fiber blanket with factory-applied jacket Flexible elastomeric Closed-cell phenolic foam ; and with field-applied jacket.
- E. Indoor Concealed, Round Outside-Air Ducts: Mineral-fiber board with factory-applied jacket Mineral-fiber blanket with factory-applied jacket Flexible elastomeric Closed-cell phenolic foam ; and with field-applied jacket.
- F. Indoor Exposed, Round Outside-Air Ducts: Mineral-fiber board with factory-applied jacket Mineral-fiber blanket with factory-applied jacket Flexible elastomeric Closed-cell phenolic foam ; and with field-applied jacket.
- G. Indoor Concealed, Rectangular Outside-Air Ducts: Mineral-fiber board with factory-applied jacket Mineral-fiber blanket with factory-applied jacket Flexible elastomeric Closed-cell phenolic foam ; and with field-applied jacket.

- H. Indoor Exposed, Rectangular Outside-Air Ducts: Mineral-fiber board with factory-applied jacket
Mineral-fiber blanket with factory-applied jacket Flexible elastomeric Closed-cell phenolic foam
; and with field-applied jacket.
- I. Indoor Concealed, Rectangular Range-Hood Exhaust Ducts: Mineral-fiber board Calcium silicate
with field-applied jacket.
- J. Indoor Exposed, Rectangular Range-Hood Exhaust Ducts: Mineral-fiber board Calcium silicate
with field-applied jacket.
- K. Indoor Concealed, Rectangular Dishwasher Exhaust Ducts: Mineral-fiber board with
factory-applied jacket Mineral-fiber blanket with factory-applied jacket Flexible elastomeric
Closed-cell phenolic foam Calcium silicate ; and with field-applied jacket.
- L. Indoor Exposed, Rectangular Dishwasher Exhaust Ducts: Mineral-fiber board with factory-applied
jacket Mineral-fiber blanket with factory-applied jacket Flexible elastomeric Closed-cell phenolic
foam Calcium silicate ; and with field-applied jacket.
- M. Outdoor Round Supply- and Return-Air Ducts: Mineral-fiber board with factory-applied jacket
Flexible elastomeric Closed-cell phenolic foam ; and with field-applied jacket.
- N. Outdoor Rectangular Supply- and Return-Air Ducts: Mineral-fiber board with factory-applied
jacket Flexible elastomeric Closed-cell phenolic foam ; and with field-applied jacket.
- O. Boiler Breeching and Connectors: Mineral-fiber board with factory-applied jacket Calcium silicate
; and with field-applied jacket.
- P. Items Not Insulated:
 - 1. Fibrous-glass ducts.
 - 2. Metal ducts with duct liner.
 - 3. Factory-insulated flexible ducts.
 - 4. Factory-insulated plenums, casings, terminal boxes, and filter boxes and sections.
 - 5. Flexible connectors.
 - 6. Vibration-control devices.
 - 7. Testing agency labels and stamps.
 - 8. Nameplates and data plates.
 - 9. Access panels and doors in air-distribution systems.

END OF SECTION 15081

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SECTION 15110 - VALVES

0.1 SUMMARY

A. General-Duty Valves:

1. Angle valves.
2. Ball valves.
3. Butterfly valves.
4. Check valves.
5. Gate valves.
6. Globe valves.
7. Plug valves.
8. Chainwheel actuators.

0.2 PRODUCTS

A. Angle Valves:

1. **NPS 2** and Smaller: Bronze body, Class(es) 125 150 and 200.
2. **NPS 2-1/2** and Larger: Cast-iron body, Class(es) 125 and 250.

B. Ball Valves:

1. **NPS 2** and Smaller: Copper-alloy body.
 - a. One Piece: Brass or bronze body; **400-psig** minimum **600-psig** CWP rating.
 - b. Two Piece: Brass or bronze Forged-brass Bronze body; full regular port; and **600-psig** CWP rating.
 - c. Three Piece: Brass or bronze Forged-brass Bronze body; full regular port; and **600-psig** CWP rating.
 - d. Safety Exhaust: Two-piece bronze body with exhaust vent and working pressure rating for compressed air of at least **125 psig** of **400-psig** CWP of **600-psig** CWP.
2. **NPS 2-1/2** and Larger: Ferrous-alloy body, Class(es) 150 and 300 with full or regular port and flanged ends.

C. Ferrous-Alloy Butterfly Valves **NPS 2-1/2** and Larger:

1. Flangeless; **150-psig 175-psig 200-psig 250-psig** and **300-psig** CWP rating; wafer type with 1 1- or 2 2-piece stem.
2. Single flange; **150-psig 175-psig 200-psig 250-psig** and **300-psig** CWP rating; wafer-lug type with 1 1- or 2 2-piece stem.
3. Flanged; **150-psig 175-psig 200-psig 250-psig** and **300-psig** CWP rating; flanged-end type with 1 1- or 2 2-piece stem.

4. Grooved-end, ductile-iron or steel body; 175-psig and 300-psig CWP rating with grooved or shouldered ends.
- D. High-Pressure Butterfly Valves NPS 2-1/2 and Larger:
1. Flangeless, Class(es) 150 and 300, wafer type.
 2. Single-flange, Class(es) 150 and 300, wafer-lug type.
- E. Bronze Check Valves NPS 2 and Smaller: Class(es) 125 150 and 200, horizontal and vertical, lift-and swing-check type.
- F. Gray-Iron Swing Check Valves NPS 2-1/2 and Larger: Class(es) 125 and 250.
- G. Ferrous-Alloy Wafer Check Valves NPS 2-1/2 and Larger: Single Dual-plate, Class 125 or 150 250 or 300.
- H. Spring-Loaded, Lift-Disc Check Valves:
1. NPS 2 and Smaller: Bronze shell, Class(es) 125 and 150.
 2. NPS 2-1/2 and Larger: Cast-iron shell, Class(es) 125 and 250.
- I. Gate Valves:
1. NPS 2 and Smaller: Bronze body, Class(es) 125 150 and 200.
 2. NPS 2-1/2 and Larger: Cast-iron body, NRS OS&Y, Class(es) 125 and 250.
- J. Globe Valves:
1. NPS 2 and Smaller: Bronze body, Class(es) 125 150 and 200.
 2. NPS 2-1/2 and Larger: Gray-iron body, Class(es) 125 and 250.
- K. Cast-Iron Plug Valves NPS 2 and Larger: Lubricated and nonlubricated types, Class 125 or 150 250 or 300.
- L. Resilient-Seated, Cast-Iron, Eccentric Plug Valves: 175-psig CWP.
- M. Chainwheel Actuators:
1. Sprocket Rim with Chain Guides: Ductile iron Cast iron Aluminum Bronze.
 2. Chain: Hot-dip, galvanized steel Brass Stainless steel.

END OF SECTION 15110

SECTION 15140 - DOMESTIC WATER PIPING

0.1 SUMMARY

- A. Domestic water piping inside the building.

0.2 PERFORMANCE REQUIREMENTS

- A. Minimum Working-Pressure Rating: **125 psig**, unless otherwise indicated.

0.3 QUALITY ASSURANCE

- A. Quality Standard for Plastic, Potable Domestic Water Piping: NSF 14.
- B. Quality Standard for Potable Domestic Water Piping: NSF 61.

0.4 PRODUCTS

- A. Valves:
 - 1. Bronze and cast-iron, general-duty valves for metal piping.
 - 2. CPVC PVC ball, butterfly, and check valves for plastic piping.

0.5 PIPE AND FITTING APPLICATIONS

- A. Domestic Water Piping on Service Side of Water Meter inside the Building:
 - 1. **NPS 4 to NPS 6**: Steel pipe and gray-iron fittings with threaded steel pipe and fittings with grooved hard copper tube and fittings, **Type L**, with soldered hard copper tube and fittings, **Type M**, with soldered hard copper tube and fittings, **Type L**, with grooved or hard copper tube and fittings, **Type M**, with grooved joints.
 - 2. **NPS 8**: Steel pipe and gray-iron fittings with threaded steel pipe and fittings with grooved hard copper tube and fittings, **Type L**, with grooved or hard copper tube and fittings, **Type M**, with grooved joints.
 - 3. **NPS 10 and NPS 12**: Steel pipe and gray-iron fittings with threaded or steel pipe and fittings with grooved joints.
- B. Under-Building-Slab, Domestic Water Piping on House Side of Water Meter, **NPS 4** and Smaller: Soft Hard copper tube and fittings, **Type L** with soldered joints.
- C. Aboveground Domestic Water Piping:

1. **NPS 1 and Smaller:** Hard copper tube and fittings, **Type L**, with soldered hard copper tube and fittings, **Type M**, with soldered CPVC, Schedule 80 pipe and fittings with threaded CPVC, Schedule 40 pipe and socket fittings with solvent-cemented CPVC, Schedule 80 pipe and socket fittings with solvent-cemented CPVC, SDR 11 tubing system with solvent-cemented or PEX distribution system and insert fittings with crimped joints.
2. **NPS 1-1/4 and NPS 1-1/2:** Hard copper tube and fittings, **Type L**, with soldered hard copper tube and fittings, **Type M**, with soldered CPVC, Schedule 80 pipe and fittings with threaded CPVC, Schedule 40 pipe and socket fittings with solvent-cemented CPVC, Schedule 80 pipe and socket fittings with solvent-cemented or CPVC, SDR 11 tubing system with solvent-cemented joints.
3. **NPS 2:** Hard copper tube and fittings, **Type L**, with soldered hard copper tube and fittings, **Type M**, with soldered hard copper tube and fittings, **Type L**, with grooved hard copper tube and fittings, **Type M**, with grooved CPVC, Schedule 80 pipe and fittings with threaded CPVC, Schedule 40 pipe and socket fittings with solvent-cemented CPVC, Schedule 80 pipe and socket fittings with solvent-cemented CPVC, SDR 11 piping system with solvent-cemented or CPVC, SDR 11 tubing system with solvent-cemented joints.
4. **NPS 2-1/2 to NPS 3-1/2:** Hard copper tube and fittings, **Type L**, with soldered hard copper tube and fittings, **Type M**, with soldered hard copper tube and fittings, **Type L**, with grooved hard copper tube and fittings, **Type M**, with grooved CPVC, Schedule 80 pipe and fittings with threaded CPVC, Schedule 40 pipe and socket fittings with solvent-cemented or CPVC, Schedule 80 pipe and socket fittings with solvent-cemented joints.
5. **NPS 4 to NPS 6:** Steel pipe and gray-iron fittings with threaded steel pipe and fittings with grooved hard copper tube and fittings, **Type L**, with soldered hard copper tube and fittings, **Type M**, with soldered hard copper tube and fittings, **Type L**, with grooved hard copper tube and fittings, **Type M**, with grooved CPVC, Schedule 80 pipe and fittings with threaded CPVC, Schedule 40 pipe and socket fittings with solvent-cemented or CPVC, Schedule 80 pipe and socket fittings with solvent-cemented joints.
6. **NPS 8:** Steel pipe and gray-iron fittings with threaded steel pipe and fittings with grooved hard copper tube and fittings, **Type L**, with grooved hard copper tube and fittings, **Type M**, with grooved or CPVC, Schedule 80 pipe and socket fittings with solvent-cemented joints.
7. **NPS 10 and NPS 12:** Steel pipe and gray-iron fittings with threaded or steel pipe and fittings with grooved joints.

D. Non-Potable-Water Piping:

1. **NPS 3-1/2 and Smaller:** Steel pipe and gray-iron fittings with threaded hard copper tube and fittings, **Type L**, with soldered hard copper tube and fittings, **Type M**, with soldered hard copper tube and fittings, **Type L**, with grooved hard copper tube and fittings, **Type M**, with grooved PVC, Schedule 80 pipe and fittings with threaded PVC, Schedule 40 pipe and socket fittings with solvent-cemented or PVC, Schedule 80 pipe and socket fittings with solvent-cemented joints.
2. **NPS 4 to NPS 6:** Steel pipe and gray-iron fittings with threaded steel pipe and fittings with grooved hard copper tube and fittings, **Type L**, with grooved hard copper tube and fittings, **Type M**, with grooved PVC, Schedule 80 pipe and fittings with threaded PVC, Schedule 40 pipe and socket fittings with solvent-cemented or PVC, Schedule 80 pipe and socket fittings with solvent-cemented joints.

3. **NPS 8:** Steel pipe and gray-iron fittings with threaded steel pipe and fittings with grooved hard copper tube and fittings, **Type L**, with grooved hard copper tube and fittings, **Type M**, with grooved PVC, Schedule 40 pipe and socket fittings with solvent-cemented or PVC, Schedule 80 pipe and socket fittings with solvent-cemented joints.

END OF SECTION 15140

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SECTION 15150 - SANITARY WASTE AND VENT PIPING

0.1 SUMMARY

- A. Soil and waste, sanitary drainage and vent piping inside the building.

0.2 PERFORMANCE REQUIREMENTS

- A. Minimum Working-Pressure Ratings:
 - 1. Soil, Waste, and Vent Piping: 10-foot head of water.
 - 2. Sanitary Sewer, Force-Main Piping: 50 psig 100 psig 150 psig .

0.3 MATERIALS

- A. Cast-Iron Pipe and Fittings: (above grade only)
 - 1. Hub-and-spigot service extra-heavy class.
 - 2. Hubless with heavy-duty, Type 304 stainless-steel heavy-duty, FM-approved, stainless-steel heavy-duty, cast-iron heavy-duty, Type 301 stainless-steel compact, stainless-steel couplings.
 - 3. Sovent fittings.
- B. ABS Pipe and Fittings: Schedule 40 Cellular-core pipe with socket fittings. (below grade only)
- C. PVC Pipe and Fittings: Solid wall Cellular-core, Schedule 40 Cellular-core, sewer and drain series pipe with socket fittings. (below grade only)

END OF SECTION 15150

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SECTION 15181 - HYDRONIC PIPING

0.1 SUMMARY

- A. Piping and hydronic specialties for hot-water heating, chilled-water cooling, and condenser-water systems, and makeup water for these systems.
- B. Blowdown drain lines.
- C. Condensate drain piping.

0.2 QUALITY ASSURANCE

- A. Quality Standard: ASME B31.9.

0.3 PRODUCTS

- A. Valves:
 - 1. General-duty valves.
 - 2. Calibrated ball valves.
 - 3. Calibrated balancing valves.
 - 4. Pressure-reducing valves.
 - 5. Safety valves.
 - 6. Automatic flow-control valves.
 - 7. Plastic ball valves.
 - 8. Plastic butterfly valves.
- B. Air Vents: Manual Automatic.
- C. Expansion Tanks: ASME labeled with bladder or diaphragm air chamber.
- D. Air Separators: Tangential type In line Air purgers.
- E. Bypass chemical feeder.
- F. Strainers: Y-pattern, basket, and T-pattern.
- G. Flexible Connectors: Stainless-steel bellows with woven-wire jacket Fiber-reinforced, rubber spherical body.
- H. Expansion control.

0.4 INSTALLATION

A. Hot- and Chilled-Water Applications:

1. **NPS 2** and Smaller: Drawn-temper copper tubing with soldered joints or Schedule 40 30 20 steel pipe with threaded joints for aboveground. Annealed-temper copper tubing with soldered joints for belowground or within slabs.
2. **NPS 2-1/2** and Larger: Schedule 40 30 20 steel pipe with welded joints grooved couplings.

B. Condensate Drain-Line Applications: Drawn-temper copper tubing with soldered joints or Schedule 40, PVC pipe with solvent-welded joints.

C. Chemical Treatment: Water analysis by Owner Contractor.

0.5 FIELD QUALITY CONTROL

A. Test Procedures: ASTM B31.9.

END OF SECTION 15181

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SECTION 15185 - HYDRONIC PUMPS

0.1 SUMMARY

- A. Close-coupled, in-line centrifugal pumps.
- B. Close-coupled, end-suction centrifugal pumps.
- C. Separately coupled, base-mounted, end-suction centrifugal pumps.

0.2 QUALITY ASSURANCE

- A. Quality Standard: UL 778.

0.3 PRODUCTS

A. Close-Coupled, In-Line Centrifugal Pumps:

- 1. Casing: Radially split, cast iron.
- 2. Impeller: Cast bronze.
- 3. Pump Shaft: Steel, with copper-alloy shaft sleeve Stainless steel.
- 4. Seal: Mechanical Packing.
- 5. Pump Bearings: Permanently lubricated ball bearings Oil lubricated; bronze-journal or thrust type.

B. Close-Coupled, End-Suction Centrifugal Pumps:

- 1. Casing: Radially split, cast iron.
- 2. Impeller: Cast bronze.
- 3. Pump Shaft: Steel, with copper-alloy shaft sleeve Stainless steel.
- 4. Seal: Mechanical.
- 5. Pump Bearings: Permanently lubricated ball bearings Oil lubricated; bronze-journal or thrust type.

C. Separately Coupled, Base-Mounted, End-Suction Centrifugal Pumps:

- 1. Casing: Radially split, cast iron. Integral mount on volute to support the casing, and attached piping.
- 2. Impeller: Cast bronze.
- 3. Pump Shaft: Steel, with copper-alloy shaft sleeve Stainless steel.
- 4. Seal: Mechanical Packing.
- 5. Pump Bearings: Grease-lubricated ball bearings contained in cast-iron housing.
- 6. Shaft Coupling: Drop-out type molded rubber insert and interlocking spider with EPDM coupling sleeve for variable-speed applications.
- 7. Coupling Guard: Dual rated; steel; removable; attached to mounting frame.

8. Mounting Frame: Welded-steel frame and cross members.

D. Specialty Fittings: Suction diffusers and triple-duty valves.

END OF SECTION 15185

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SECTION 15189 - HVAC WATER TREATMENT

0.1 SUMMARY

A. Water treatment systems for the following:

1. Heating, hot-water piping (closed loop).
2. Chilled-water piping (closed loop).
3. Heating, steam, and condensate piping.
4. Steam and condensate piping for humidifiers and cooking systems (open loop).
5. Condenser water piping (open loop).

B. System Description:

1. Closed-Loop System: Bypass feeder to introduce chemical treatment, with isolating and drain valves downstream from circulating pumps.
2. Closed-Loop, Heating Steam and Condensate Piping: Lead-lag switch controls sequence of boilers and introduces chemical to boiler through bypass feeder.
3. Open-Loop Systems for Humidifiers, Air Washers, Evaporative Condensers, and Cooling Towers: Drip feeders Polypropylene mesh bags PVC tubing to feed chemical.
4. Open-Loop, Condenser Water Piping: Sequestering agent and corrosion inhibitor pumped from solution tank into condenser water supply to tower.

0.2 MAINTENANCE

A. Chemical and Service Program: One year.

0.3 PRODUCTS

A. Bypass Feeders: Cast iron or steel.

1. Capacity: 2 quarts 1.8 gal. 5 gal..
2. Working Pressure: 125 psig 175 psig.

B. Drip feeders.

C. Positive-displacement diaphragm piston pumps.

D. Chemical Solution Tanks: 30 gal. 50 gal..

E. Agitator.

F. Liquid-level switch.

G. Packaged conductivity controller.

- H. Cold-water meter.
- I. Solenoid valves.
- J. Electronic timers.
- K. Chemical tubing.
- L. Plastic ball valves.
- M. Plastic-body strainer.
- N. Condenser water-treatment control panel.
- O. Chemical treatment test equipment.
- P. Chemicals:
 - 1. System cleaner.
 - 2. Biocide.
 - 3. Closed-loop, water piping chemicals to reduce deposits and adjust pH, corrosion inhibitors, and conductivity enhancers.
 - 4. Heating steam and condensate piping chemicals to reduce hardness and prevent feedline congestion, and to provide alkalinity, oxygen scavenger, carbon-dioxide neutralizer, and filming amines.
 - 5. Open-loop, condenser water piping chemicals to inhibit scaling, reduce alkalinity and pH, corrosion inhibitor, and biocide.
 - 6. Open-loop piping for humidifiers, air washers, evaporative condensers, small cooling towers, and liquid coolers chemicals to inhibit scaling, corrosion inhibitor, and biocide nonoxidizing.
- Q. Condenser Water Filtration Unit: Sand filter, filter pump, strainer, and automatic backwash controls.
- R. Hot-Water/Chiller-Water Filtration Unit: Stainless-steel housing and polypropylene filter.

0.4 INSTALLATION

- A. Water Analysis: By Contractor.

END OF SECTION 15189

SECTION 15194 - FUEL GAS PIPING

0.1 SUMMARY

- A. Fuel gas piping, specialties, and accessories within the building.

0.2 PROJECT CONDITIONS

- A. Gas System Pressures:

- 1. One pressure range. 0.5 psig or less More than 0.5 psig but not more than 2.0 psig More than 2.0 psig but not more than 5.0 psig.

0.3 QUALITY ASSURANCE

- A. Quality Standard: ANSI Z223.1.

0.4 MATERIALS

- A. Piping Materials:

- 1. Steel pipe, Schedule 40, black, with malleable-iron threaded cast-iron flanges and flanged steel welding steel threaded steel flanges and flanged fittings.
 - 2. Hard copper tube with wrought-copper bronze flanges and flanged fittings.
 - 3. Soft copper tube with wrought-copper fittings.
 - 4. Tin-lined copper tube with wrought-copper fittings.
 - 5. Transition fittings.

- B. Protective Coating: Polyethylene.

- C. Flexible connectors.

- D. Quick-disconnect devices.

- E. Specialty Valves:

- 1. Appliance connector valves.
 - 2. Gas stops.
 - 3. Gas valves.
 - 4. Plug valves.
 - 5. General-duty valves.
 - 6. Automatic gas valves.
 - 7. Electrically operated gas valves.
 - 8. Earthquake valves.

0.5 COMPONENTS

- A. Service Meters: By gas supplier.
- B. Turbine Meters: Axial-flow type.
- C. Pressure Regulators:
 - 1. Service Pressure Regulators: 100-psig inlet pressure rating.
 - 2. Line Pressure Regulators: 2-psig- minimum 5-psig- minimum 10-psig inlet pressure rating.
 - 3. Appliance pressure regulators.

0.6 INSTALLATION

- A. Fuel Gas Piping Applications, 0.5 psig or Less:
 - 1. NPS 1/2 and Smaller: Steel Hard copper Tin-lined copper Corrugated stainless steel.
 - 2. NPS 3/4 and NPS 1: Steel Hard copper Corrugated stainless steel.
 - 3. NPS 1-1/4 and Larger: Steel.
- B. Fuel Gas Piping Applications, 0.5 to 2 psig:
 - 1. NPS 1/2 and Smaller: Steel Hard copper Tin-lined copper Corrugated stainless steel.
 - 2. NPS 3/4 and NPS 1: Steel Hard copper Corrugated stainless steel.
 - 3. NPS 1-1/4 and Larger: Steel.
- C. Fuel Gas Piping Applications, 2 to 5 psig: Steel.
- D. Underground Fuel Gas Piping Applications: Steel, encased in containment conduit.
- E. Containment Conduit Applications: Steel.
- F. Gas Service Piping Applications at Meters and Regulators, Above 5 psig: Steel.

END OF SECTION 15194

SECTION 15410 - PLUMBING FIXTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes plumbing fixtures and related components.
- B. Related Sections include the following:
 - 1. Division 15 Section "Security Plumbing Fixtures."
 - 2. Division 15 Section "Drinking Fountains and Water Coolers."
 - 3. Division 15 Section "Plumbing Specialties" for backflow preventers and specialty fixtures not in this Section.

1.3 DEFINITIONS

- A. Accessible Fixture: Plumbing fixture that can be approached, entered, and used by people with disabilities.
- B. Fitting: Device that controls flow of water into or out of plumbing fixture. Fittings specified in this Section include supplies and stops, faucets and spouts, shower heads and tub spouts, drains and tailpieces, and traps and waste pipes. Piping and general-duty valves are included where indicated.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain plumbing fixtures, faucets, and other components of each category through one source from a single manufacturer.
 - 1. Exception: If fixtures, faucets, or other components are not available from a single manufacturer, obtain similar products from other manufacturers specified for that category.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities"; Public Law 90-480, "Architectural Barriers Act"; and Public

Law 101-336, "Americans with Disabilities Act"; about plumbing fixtures for people with disabilities.

- D. Regulatory Requirements: Comply with requirements in U.S. Architectural & Transportation Barriers Compliance Board's "Uniform Federal Accessibility Standards (UFAS), 1985-494-187" about plumbing fixtures for people with disabilities.
- E. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.
- F. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.
- G. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.
- H. Comply with the following applicable standards and other requirements specified for plumbing fixtures:
 - 1. Enameled, Cast-Iron Fixtures: ASME A112.19.1M.
 - 2. Hand Sinks: NSF 2 construction.
 - 3. Plastic Bathtubs: ANSI Z124.1.
 - 4. Plastic Lavatories: ANSI Z124.3.
 - 5. Plastic Laundry Trays: ANSI Z124.6.
 - 6. Plastic Mop-Service Basins: ANSI Z124.6.
 - 7. Plastic Shower Enclosures: ANSI Z124.2.
 - 8. Plastic Sinks: ANSI Z124.6.
 - 9. Plastic Whirlpool Bathtubs: ANSI Z124.1 and ASME A112.19.7M.
 - 10. Porcelain-Enameled, Formed-Steel Fixtures: ASME A112.19.4M.
 - 11. Slip-Resistant Bathing Surfaces: ASTM F 462.
 - 12. Stainless-Steel Fixtures Other Than Service Sinks: ASME A112.19.3M.
 - 13. Vitreous-China Fixtures: ASME A112.19.2M.
 - 14. Water-Closet, Flush Valve, Tank Trim: ASME A112.19.5.
 - 15. Water-Closet, Flushometer Tank Trim: ASSE 1037.
 - 16. Whirlpool Bathtub Fittings: ASME A112.19.8M.
- I. Comply with the following applicable standards and other requirements specified for lavatory and sink faucets:
 - 1. Backflow Protection Devices for Faucets with Side Spray: ASME A112.18.3M.
 - 2. Backflow Protection Devices for Faucets with Hose-Thread Outlet: ASME A112.18.3M.
 - 3. Diverter Valves for Faucets with Hose Spray: ASSE 1025.
 - 4. Faucet Hose: ASTM D 3901.
 - 5. Faucets: ASME A112.18.1M.
 - 6. Hose-Connection Vacuum Breakers: ASSE 1011.
 - 7. Hose-Coupling Threads: ASME B1.20.7.
 - 8. Integral, Atmospheric Vacuum Breakers: ASSE 1001.
 - 9. NSF Materials: NSF 61.
 - 10. Pipe Threads: ASME B1.20.1.
 - 11. Sensor-Actuated Faucets and Electrical Devices: UL 1951.
 - 12. Supply and Drain Fittings: ASME A112.18.1M.

PLUMBING FIXTURES

- J. Comply with the following applicable standards and other requirements specified for bathtub and shower faucets:
1. Backflow Protection Devices for Hand-Held Showers: ASME A112.18.3M.
 2. Combination, Pressure-Equalizing and Thermostatic-Control Antiscald Faucets: ASSE 1016.
 3. Faucets: ASME A112.18.1M.
 4. Hand-Held Showers: ASSE 1014.
 5. High-Temperature-Limit Controls for Thermal-Shock-Preventing Devices: ASTM F 445.
 6. Hose-Coupling Threads: ASME B1.20.7.
 7. Manual-Control Antiscald Faucets: ASTM F 444.
 8. Pipe Threads: ASME B1.20.1.
 9. Pressure-Equalizing-Control Antiscald Faucets: ASTM F 444 and ASSE 1016.
 10. Sensor-Actuated Faucets and Electrical Devices: UL 1951.
 11. Thermostatic-Control Antiscald Faucets: ASTM F 444 and ASSE 1016.
- K. Comply with the following applicable standards and other requirements specified for miscellaneous fittings:
1. Atmospheric Vacuum Breakers: ASSE 1001.
 2. Brass and Copper Supplies: ASME A112.18.1M.
 3. Manual-Operation Flushometers: ASSE 1037.
 4. Plastic Tubular Fittings and Piping: ASTM F 409.
 5. Sensor-Operation Flushometers: ASSE 1037 and UL 1951.
 6. Tubular Brass Drainage Fittings and Piping: ASME A112.18.1M.
- L. Comply with the following applicable standards and other requirements specified for miscellaneous components:
1. Disposers: ASSE 1008 and UL 430.
 2. Floor Drains: ASME A112.21.1M.
 3. Grab Bars: ASTM F 446.
 4. Hose-Coupling Threads: ASME B1.20.7.
 5. Hot-Water Dispensers: ASSE 1023 and UL 499.
 6. Off-Floor Fixture Supports: ASME A112.6.1M.
 7. Pipe Threads: ASME B1.20.1.
 8. Plastic Shower Receptors: ANSI Z124.2.
 9. Plastic Toilet Seats: ANSI Z124.5.
 10. Supply and Drain Protective Shielding Guards: ICC A117.1.
 11. Whirlpool Bathtub Equipment: UL 1795.

1.5 COORDINATION

- A. Coordinate roughing-in and final plumbing fixture locations, and verify that fixtures can be installed to comply with original design and referenced standards.

PART 2 - EXECUTION

Not Used.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in for water soil and for waste piping systems and supports to verify actual locations and sizes of piping connections and that locations and types of supports match those indicated, before plumbing fixture installation. Use manufacturer's roughing-in data if roughing-in data are not indicated.
- B. Examine walls, floors, and cabinets for suitable conditions where fixtures are to be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FIXTURE INSTALLATION

- A. Assemble fixtures, trim, fittings, and other components according to manufacturers' written instructions.
- B. For wall-hanging fixtures, install off-floor supports affixed to building substrate.
 - 1. Use carrier supports with waste fitting and seal for back-outlet fixtures.
 - 2. Use carrier supports without waste fitting for fixtures with tubular waste piping.
 - 3. Use chair-type carrier supports with rectangular steel uprights for accessible fixtures.
- C. Install back-outlet, wall-hanging fixtures onto waste fitting seals and attach to supports.
- D. Install floor-mounting fixtures on closet flanges or other attachments to piping or building substrate.
- E. Install wall-hanging fixtures with tubular waste piping attached to supports.
- F. Install floor-mounting, back-outlet water closets attached to building floor substrate and wall bracket and onto waste fitting seals.
- G. Install counter-mounting fixtures in and attached to casework.
- H. Install fixtures level and plumb according to manufacturers' written instructions and roughing-in drawings.
- I. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.

1. Exception: Use ball, gate, or globe valve if stops are not specified with fixture. Refer to Division 15 Section "Valves" for general-duty valves.
- J. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.
- K. Install tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system.
- L. Install flushometer valves for accessible water closets and urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach.
- M. Install tanks for accessible, tank-type water closets with lever handle mounted on wide side of compartment.
- N. Install toilet seats on water closets.
- O. Install faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.
- P. Install water-supply, flow-control fittings with specified flow rates in fixture supplies at stop valves.
- Q. Install faucet, flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.
- R. Install shower, flow-control fittings with specified maximum flow rates in shower arms.
- S. Install traps on fixture outlets.
 1. Exception: Omit trap on fixtures with integral traps.
 2. Exception: Omit trap on indirect wastes, unless otherwise indicated.
- T. Install disposer in outlet of sinks indicated to have disposer. Install switch where indicated or in wall adjacent to sink if location is not indicated.
- U. Install hot-water dispensers in back top surface of sink or in counter with spout over sink.
- V. Install escutcheons at piping wall ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for escutcheons.
- W. Set bathtubs, shower receptors, and service basins in leveling bed of cement grout. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for grout.
- X. Seal joints between fixtures and walls, floors, and counters using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color. Refer to Division 7 Section "Joint Sealants" for sealant and installation requirements.

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3.3 FIELD QUALITY CONTROL

- A. Verify that installed fixtures are categories and types specified for locations where installed.
- B. Check that fixtures are complete with trim, faucets, fittings, and other specified components.
- C. Inspect installed fixtures for damage. Replace damaged fixtures and components.
- D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.
- E. Install fresh batteries in sensor-operated mechanisms.

END OF SECTION 15410

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SECTION 15413 - SECURITY PLUMBING FIXTURES

0.1 SUMMARY

- A. Security plumbing fixtures for detention facilities.

0.2 QUALITY ASSURANCE

- A. Regulatory Requirements: ICC A117.1 ICC A117.1 and Americans with Disabilities Act UFAS.
- B. Quality Standard: NFS 61.

0.3 PRODUCTS

- A. Security Combination Units: Back-mounting type; cabinet fixture with integral water closet and lavatory; stainless steel.
 - 1. Water Closet: Elongated bowl, blowout, back siphon-jet, back siphon-jet, floor outlet, concealed flushometer with 3.5-gal./flush 1.6-gal./flush consumption.
 - 2. Lavatory in Cabinet Top:
 - a. Receptor: Oval Rectangular.
 - b. Supply Valves: Pneumatic Mechanical metering Electronic solenoid.
 - c. Filler Spout: Backsplash or deck Backsplash Deck mounted.
 - d. Waste and trap Concealed waste spilling into water-closet bowl.
 - e. Toothbrush holder.
 - f. Towel hooks.
 - g. Bubbler.
 - 3. Cabinet: Rectangular Five sided with two-angled sides Four sided with left-angled side Five sided with right-angled side apron, for above on-floor installation.
- B. Security Drinking Fountains: Back Front-mounting type, accessible; stainless steel.
- C. Security Lavatories:
 - 1. Type: Back Front-mounting type, accessible; stainless steel.
 - 2. Type: Vitreous china.
- D. Security Service Sinks: Back-mounting type, stainless steel; for above on-floor installation.
- E. Security Shampoo Bowls: Front-mounting type, stainless steel; for above-floor counter-mounting installation.
- F. Security Showers:

1. Type: Back Front-mounting type, accessible, stainless steel; recessed for flush installation; wall type with shower head and soap dish.
2. Type: Front-mounting type, accessible, stainless steel; for surface installation; wall type with shower head and soap dish.
3. Type: Back-mounting type, accessible, stainless steel; cabinet with floor and top with stainless-steel soap dish, towel hook, seat, and grab bar.
 - a. Size: 42 or 44 by 36 inches 48 by 36 inches 30 by 30 inches 32 by 32 inches 36 by 36 inches.

G. Security Urinals:

1. Type: Back-mounting type, stainless steel; blowout washout washout, trough-type back inlet.
2. Type: Front-mounting type, stainless steel; blowout washout washout, trough-type back top inlet.
3. Type: Back Front-mounting type, stainless steel; for wall-and-floor installation; washout, stall-type back top inlet.
4. Flushing Device: Concealed flushometer valve with push-button mechanism and 3.5-gal./flush 1.5-gal./flush 1.0-gal./flush consumption.

H. Security Water Closets:

1. Type: Back-mounting type, accessible, stainless steel; for above-floor installation; compact design.
 - a. Bowl: Elongated, with back inlet, blowout design with back outlet.
 - b. Flushing Device: Concealed flushometer valve with push-button mechanism and 3.5-gal./flush consumption.
2. Type: Back Front-mounting type, accessible, stainless steel; for off-floor installation; standard design.
 - a. Bowl: Elongated, with back top inlet, blowout siphon-jet design with back outlet.
 - b. Flushing Device: Concealed flushometer valve with push-button oscillating lever-handle mechanism and 3.5-gal./flush 1.6-gal./flush consumption.
3. Type: Back Front-mounting type, accessible, stainless steel; for on-floor installation; standard design.
 - a. Bowl: Elongated, with back top inlet, siphon-jet design with back floor outlet.
 - b. Flushing Device: Concealed flushometer valve with push-button oscillating lever-handle mechanism and 3.5-gal./flush 1.6-gal./flush consumption.
4. Type: Vitreous china; wall-hanging and on-floor installation; back-inlet, blowout siphon-jet fixture.

- a. Flushing Device: Concealed flushometer valve with push-button mechanism and ~~3.5-gal./flush~~ 1.6-gal./flush consumption.
- 5. Type: Vitreous china, accessible; wall-hanging installation; back-inlet, blowout fixture.
 - a. Flushing Device: Concealed flushometer valve with push-button mechanism and ~~3.5-gal./flush~~ consumption.

END OF SECTION 15413

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15430 - PLUMBING SPECIALTIES

0.1 SUMMARY

A. Plumbing Specialties:

1. Backflow preventers.
2. Dishwasher air-gap fittings.
3. Water regulators.
4. Balancing valves.
5. Water filters.
6. Thermostatic water mixing and water tempering valves.
7. Strainers.
8. Outlet boxes and washer-supply outlets.
9. Hose stations.
10. Key-operation wheel-handle wall and nondraining nonfreeze post hydrants.
11. Trap seal primer valves.
12. Drain valves.
13. Backwater valves.
14. Miscellaneous piping specialties.
15. Sleeve penetration systems.
16. Flashing materials.
17. Cleanouts.
18. Floor trench plastic floor roof and plastic roof drains.
19. Grease oil and solids interceptors.
20. Grease recovery units.

0.2 PERFORMANCE REQUIREMENTS

A. Minimum Working-Pressure Ratings:

1. Domestic Water Piping: **125 psig.**
2. Sanitary Waste and Vent Piping: **10-foot head of water.**
3. Storm Drainage Piping: **10-foot head of water.**
4. Force-Main Piping: **100 psig.**

0.3 QUALITY ASSURANCE

- A. Quality Standard for Plastic Domestic Water Piping Components: NSF 14.
- B. Quality Standard for Potable Domestic Water Plumbing Specialties: NSF 61.

0.4 PRODUCTS

A. Backflow Preventers:

1. Pipe-applied, atmospheric-type vacuum breakers.
2. Hose-connection vacuum breakers.
3. Intermediate atmospheric-vent backflow preventers.
4. Reduced-pressure-principle backflow preventers.
5. Double-check backflow prevention assemblies.
6. Antisiphon-pressure-type vacuum breakers.
7. Dual-check-valve-type backflow preventers for continuous pressure.
8. Dual-check-valve-type backflow preventer for carbonated beverage dispensers.
9. Laboratory faucet vacuum breakers.
10. Reduced-pressure detector assembly backflow preventers.
11. Double-check detector assembly backflow preventers.
12. Hose-connection backflow preventers.
13. Back-siphonage backflow vacuum breakers.

B. Dishwasher air-gap fittings, deck mounted.

C. Water Regulators: Single-seated, direct-operated single-seated, direct-operated, integral-bypass and pilot-operated type.

D. Balancing Valves: Calibrated and memory-stop type.

E. Thermostatic Water Mixing Valves: Manifolded assemblies hydrotherapy assemblies and photographic-process assemblies with cabinet.

F. Water Tempering Valves: System and limited volume.

G. Strainers: Y-pattern T-pattern and drainage basket.

H. Outlet Boxes: Clothes washer ice maker and dialysis equipment.

I. Washer-supply outlets.

J. Hose Stations: Mixing valve and single valve.

K. Key-Operation Hydrants: Nonfreeze exposed-outlet wall nonfreeze concealed-outlet wall moderate-climate concealed-outlet wall hot and cold, nonfreeze concealed-outlet wall nonfreeze concealed-outlet ground and nonfreeze exposed-outlet ground post hydrants.

L. Wheel-handle wall hydrants.

M. Nondraining Nonfreeze Post Hydrants: Closed Vented reservoir.

N. Trap Seal Primer Valves: Supply-type trap seal primer valves drainage-type trap seal primer valves and trap seal primer system.

- O. Drain Valves: Hose end, ball hose end, gate and stop and waste.
- P. Backwater Valves: Horizontal, closed-position, check horizontal, open-position, check and drain outlet valves.
- Q. Miscellaneous Piping Specialties:
1. Water Hammer Arresters: Metal-bellows Piston type.
 2. Hose Bibbs: Integral or field-installed vacuum breaker.
 3. Air vents.
 4. Air-Admittance Valves: Stack vent and fixture vent.
 5. Roof Flashing Assemblies: Lead flashing with open-top low-silhouette extended vent cap.
 6. Open drains.
 7. Deep-seal traps.
 8. Floor-drain inlet fittings.
 9. Fixed air-gap fittings.
 10. Stack flashing fittings.
 11. Vent caps.
 12. Vent terminals.
 13. Expansion joints.
 14. Downspout Boots: Gray-iron casting Cast-iron soil pipe.
 15. Conductor nozzles.
- R. Sleeve penetration systems.
- S. Flashing Materials: Lead Copper Zinc-coated steel Elastic membrane.
- T. Cleanouts, Insert drawing designation: ASME A112.36.2M ASME A112.3.1.
1. Application: Floor cleanout Wall cleanout For installation in exposed piping.
 2. Body or Ferrule Material: Cast iron Plastic Stainless steel.
 3. Closure: Brass plug Plastic plug.
 4. Frame and Cover Material and Finish: Painted cast iron Nickel-bronze, copper alloy Polished bronze Rough bronze Stainless steel.
 5. Top Loading Classification: Light Medium Heavy Extra Heavy- Special Duty.
- U. Floor Drains, Insert drawing designation: ASME A112.21.1M ASME A112.21.1M with ASME A112.14.1, backwater valve ASME A112.3.1.
1. Application: Area drain Floor drain Funnel floor drain.
 2. Body Material: Gray iron Stainless steel.
 3. Exposed Surfaces and Interior Lining: Acid-resistant enamel Not required.
 4. Sediment Bucket: Not required.
 5. Top of Body and Strainer Finish: Nickel bronze Polished bronze Rough bronze Stainless steel.
 6. Top Loading Classification: Light Medium Heavy Extra Heavy- Special Duty.
 7. Funnel: Required Not required.

V. Trench Drains, Insert drawing designation: ASME A112.21.1M ASME A112.3.1 .

1. Body Material: Gray iron Stainless steel.
2. Grate Material: Gray iron Ductile iron Stainless steel.
3. Top Loading Classification: Light Medium Heavy Extra Heavy- Special Duty.

END OF SECTION 15430

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SECTION 15469 - WATER SOFTENERS

0.1 SUMMARY

- A. Commercial water softeners.

0.2 WARRANTY

- A. Materials and Workmanship:
 - 1. Household Water Softener, Warranty Period: Five years.
 - 2. Commercial Water Softener, Warranty Period:
 - a. Mineral Tanks: Five years.
 - b. Brine Tanks: Five years.
 - c. Controls: Five years.
 - d. Underdrain Systems: Five years.

0.3 COMMERCIAL WATER SOFTENERS

- A. Description: Factory-assembled, pressure-type water softener.
- B. Configuration: Twin unit with two mineral tanks and one brine tank.
- C. Mineral Tanks: FRP, pressure-vessel quality.
 - 1. Construction: Non-ASME code. Comply with ASME Boiler and Pressure Vessel Code: Section X, "Fiber-Reinforced Plastic Pressure Vessels."
 - 2. Pressure Rating: 100 psig 125 psig minimum.
- D. Mineral Tanks: Steel, electric welded; pressure-vessel quality.
 - 1. Construction: Non-ASME code. Comply with ASME Boiler and Pressure Vessel Code: Section VIII, "Pressure Vessels."
 - 2. Pressure Rating: 100 psig 125 psig 150 psig minimum.
 - 3. Wetted Components: Suitable for water temperatures from 40 to at least 100 deg F 40 to at least 120 deg F 40 to at least 150 deg F.
 - 4. Finish: Hot-dip galvanized on exterior and interior of tank after fabrication unless tank is stainless steel Exterior of tank spray painted with rust-resistant prime coat. Interior lined with epoxy-polyamide coating.
- E. Controls: Automatic; factory mounted on unit and factory wired.
- F. Brine Tank: Combination measuring and wet-salt storing system.

1. Tank and Cover Material: Fiberglass or molded PE.
2. Size: Large enough for at least four regenerations at full salting.

END OF SECTION 15469

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SECTION 15486 - FUEL-FIRED, DOMESTIC WATER HEATERS

0.1 SUMMARY

- A. Commercial, gas water heaters.
- B. Compression tanks.

0.2 QUALITY ASSURANCE

- A. Gas Water Heaters: AGA certification labeled.
- B. Quality Standard for Water Heater, Hot-Water Storage Tanks: ASME Boiler and Pressure Vessel Code.
- C. Performance Efficiency Standards:
 - 1. Commercial Water Heaters: ASHRAE 90.1.
 - 2. Household Water Heaters: ASHRAE 90.2.

0.3 WARRANTY

- A. Materials and Workmanship for Storage Tanks: Five years.
- B. Materials and Workmanship for Circulators: Five years.
- C. Materials and Workmanship for Burner Assemblies: Five years.

0.4 PRODUCTS

- A. Commercial, Tube-Type, Gas Water Heaters: UL 795 and ANSI Z21.13; storage tank, circulator, piping, and controls.
 - 1. Water Heater: Enclosed, insulated unit with controls.
 - a. Construction: **160-psig** working-pressure rating.
 - b. Heat Exchanger: Copper, horizontal-grid, coiled, finned tube with bronze or glass-lined cast-iron headers.
 - c. Burner:
 - 1) Temperature Control: Adjustable, interlocked with circulator and burner.
 - 2) Safety Control: Automatic, high-temperature-limit cutoff.
 - 3) Automatic ignition.
 - 4) Automatic damper.

2. Hot-Water Storage Tank: Steel with 150-psig 125-psig working-pressure rating.
 3. Mounting: Factory mounted on skids.
 4. Circulator: All bronze, in-line, centrifugal, single-stage, radially split case design; with 125-psig- minimum working-pressure rating.
- B. Commercial, Storage, Powered-Burner, Gas Water Heaters: UL 795.
1. Storage Tank: ASME-code steel with 150-psig working-pressure rating.
 2. Burner: Powered burner for natural-gas fuel, UL 795.
 - a. Temperature Control: Adjustable thermostat.
 - b. Safety Controls: Automatic, high-temperature-limit and low-water cutoff.
 - c. Automatic ignition.
 - d. Automatic damper.
- C. Commercial, Storage, Forced-Draft, Gas Water Heaters: UL 795.
1. Shell: ASME-code steel with 150-psig working-pressure rating.
 - a. Fire Tubes: Single-pass, copper-clad, seamless steel.
 2. Burner: Forced-draft assembly for natural-gas fuel, UL 795.
 - a. Temperature Control: Adjustable thermostat.
 - b. Safety Controls: Automatic, high-temperature-limit and low-water cutoff.
 - c. Automatic ignition.
 - d. Automatic damper.
- D. Commercial, High-Efficiency, Gas Water Heaters:
1. Sealed-combustion-chamber configuration, ANSI Z21.13 and UL 795, with nominal efficiency rating not less than 85 percent.
 - a. Unit Construction: ASME code with 160-psig working-pressure rating.
 - b. Burner: For use with sealed combustion chamber and natural-gas fuel, UL 795.
 2. Burner: Condensing type for natural-gas fuel, UL 795.
 - a. Temperature Control: Adjustable thermostat.
 - b. Automatic ignition.
 - c. Automatic damper.
- E. Compression Tanks: Steel, pressure-rated tank with welded joints and factory-installed, butyl-rubber diaphragm.
1. Construction: 150-psig 100-psig working-pressure rating.

F. Accessories:

1. Combination temperature and pressure relief valves.
2. Pressure relief valves.
3. Vacuum relief valves.
4. Gas Shutoff Valves: Manually operated.
5. Gas pressure regulators.
6. Automatic valves.
7. Water heater stand and drain pan units.
8. Water heater stands.
9. Water heater mounting brackets.
10. Drain pans.
11. Piping manifold kits.
12. Piping-type heat traps.

END OF SECTION 15486

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SECTION 15500 - FIRE PROTECTION

GENERAL:

Related Documents:

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

Summary:

This Section includes fire-suppression piping and equipment for the following building systems:

Wet-pipe, fire-suppression sprinklers, including piping, valves, specialties, and automatic sprinklers.
Contract starting Point: 5 feet out from building.

Related Sections include the following:

Division 10 Section "Fire-Protection Specialties" for cabinets and fire extinguishers.
Division 16 Section "Fire Alarm Systems" for alarm devices not in this Section.

Definitions:

Working Plans: Documents, including drawings, calculations, and material specifications prepared according to NFPA 13 and NFPA 14 for obtaining approval from authorities having jurisdiction.

Authority having Jurisdiction: The building official, Engineer and the insurance underwriter where applicable.

System Performance Requirements:

Design sprinkler piping according to the following and obtain approval from authorities having jurisdiction. For projects governed by the Utah State Fire Marshal's office, obtain approval from the Engineer prior to the State Fire Marshal:

1. Design Sprinkler system with the following reduced flow data:

Flow Data available at base of fire sprinkler system riser
Static - 45 psi
Residual - 32 psi @ 360 gpm flowing

Flow data was provided by Protection Consultants, Inc.

2. Include losses through water-service piping and valves.

3. Sprinkler Occupancy Hazard Classifications: As follows:

Office and Public Areas: Light Hazard.

Mechanical Equipment Rooms: Ordinary Hazard, Group 1.

Building Service Areas: Ordinary Hazard, Group 1.

Electrical Equipment Rooms: Ordinary Hazard, Group 1.

General Storage Areas: Ordinary Hazard, Group 1.

Library Stack Areas: Ordinary Hazard, Group 2.

4. Minimum Density for Automatic-Sprinkler Piping Design: As follows:

(Reduce Design areas with quick response heads when applicable and increase design area as required for pitched ceilings or Dry Pipe Systems.

Light-Hazard Occupancy: 0.10 gpm over 1500-sq. ft. area.

Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm over 1500- sq. ft. area.

Ordinary-Hazard, Group 2 Occupancy: 0.20 gpm over 1500- sq. ft. area.

Special Occupancy Hazard: As determined by authorities having jurisdiction.

5. Maximum Protection Area per Sprinkler: As follows (except as modified by authorities having jurisdiction)

Office Space: 225 sq. ft.

Storage Areas: 130 sq. ft.

Mechanical Equipment Rooms: 130 sq. ft.

Electrical Equipment Rooms: 130 sq. ft.

Other Areas: According to NFPA 13 recommendations, unless otherwise indicated.

Components and Installation: Capable of producing piping systems with 175-psig minimum working-pressure rating, unless otherwise indicated.

Submittals:

Product Data: For the following:

(All products to be domestic manufactured)

- Pipe and fitting materials and methods of joining for sprinkler piping.

- Pipe hangers and supports.

- Valves, including specialty valves, accessories, and devices.

- Alarm devices.

- Fire department connections. Include type; number, size, and arrangement of inlets; caps and chains; size and direction of outlet; escutcheon and marking; and finish.

- Sprinklers, escutcheons, and guards. Include sprinkler flow characteristics, mounting, finish, and other pertinent data.

Fire-Hydrant Flow Test Report: As specified in "Preparation" Article.

Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction. Include hydraulic calculations, unless noted otherwise. For designs governed by the Utah State Fire Marshal's office, drawings are to be approved by the Engineer first.

Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13 and NFPA 14. Include "Contractor's Material and Test Certificate for Aboveground Piping" and "Contractor's Material and Test Certificate for Underground Piping."

Maintenance Data: For each type of standpipe and sprinkler specialty to include in maintenance manuals specified in Division 1.

Quality Assurance:

Installer Qualifications: An experienced installer who has designed and installed fire-suppression piping similar to that indicated for this Project and obtained design approval and inspection approval from authorities having jurisdiction. The Engineer requires evidence to support the ability of the contractor to perform work in the scope and volume as specified. A contractor who cannot show such experience, may be found not suitable to perform the work.

PRE-APPROVED CONTRACTOR LIST:

Delta Fire
Western States
Grinnell
Western Automatic
Firetrol
Fire Engineering
Chapparel
Kimco

Engineering Responsibility:

Preparation of working plans, calculations, and field test reports by a qualified professional engineer or Engineering Technician NICET Level III. Base calculations on results of fire-hydrant flow test or refer to data provided in section 1.4.A.1.

Manufacturer Qualifications:

Firms whose equipment, specialties, and accessories are listed by product name and manufacturer in UL's "Fire Protection Equipment Directory" and FM's "Fire Protection Approval Guide" and that comply with other requirements indicated.

Standpipe and Sprinkler Components: Listing/approval stamp, label, or other marking by a testing agency acceptable to authorities having jurisdiction.

Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

NFPA Standards: Equipment, specialties, accessories, installation, and testing complying with the following:

NFPA 13-96, "Installation of Sprinkler Systems."
NFPA 14-96, "Standpipe and Hose Systems."
NFPA 70-96, "National Electric Code."
NFPA 72-96, "National Fire Alarm Code."

International Conference of Building Code Officials codes and standards complying with the following:

UBC-1997, "Uniform Building Code"
UFC-1997, "Uniform Fire Code"

Extra Materials:

Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

Sprinkler Cabinets:

A supply of spare sprinklers (never less than 6 total) shall be supplied and located in a cabinet where the temperature does not exceed 100°F. These sprinklers shall correspond to the types and temperature ratings of the sprinklers installed on the project. Special sprinkler head wrenches shall be included to correspond to the types of heads provided.

The stock of spare sprinklers shall include a minimum of two (2) for each type and rating installed, and shall be as follows:

For systems with not over 300 sprinklers, not less than 6 sprinklers.
For systems with 300 to 1000 sprinklers, not less than 12 sprinklers.
For systems with over 1000 sprinklers, not less than 24 sprinklers.

PRODUCTS:

Manufacturers:

Subject to compliance with requirements, provide products by one of the following:

Specialty Valves and Devices:

Badger Fire Protection, Inc.
Central Sprinkler Corp.
Firematic Sprinkler Devices, Inc.
Globe Fire Sprinkler Corp.
Grinnell Corp.
Reliable Automatic Sprinkler Co., Inc.
Star Sprinkler Corp.
Viking Corp.

Water-Flow Indicators and Supervisory Switches:

Gamewell Co.
Grinnell Corp.
Pittway Corp.; System Sensor Div.
Potter Electric Signal Co.
Reliable Automatic Sprinkler Co., Inc.
Viking Corp.
Watts Industries, Inc.; Water Products Div.

Fire Department Connections:

Elkhart Brass Mfg. Co., Inc.
Fire-End and Croker Corp.
Firematic Sprinkler Devices, Inc.
Grinnell Corp.

Reliable Automatic Sprinkler Co., Inc.
Smith Industries, Inc.; Potter-Roemer Div.

Sprinklers:

Central Sprinkler Corp., (except "Omega" type sprinklers)
Firematic Sprinkler Devices, Inc.
Globe Fire Sprinkler Corp.
Grinnell Corp.
Reliable Automatic Sprinkler Co., Inc.
Star Sprinkler Corp.
Viking Corp.
Victaulic Co. of America

Gate Valves:

American Cast Iron Pipe Co.; Waterous Co.
Grinnell Corp.
McWane, Inc.; Clow Valve Co. Div.
McWane, Inc.; Kennedy Valve Div.
Nibco, Inc.
Stockham Valves & Fittings, Inc.

Indicator Valves:

Central Sprink, Inc.
Grinnell Corp.
McWane, Inc.; Kennedy Valve Div.
Milwaukee Valve Co., Inc.
Nibco, Inc.

Victaulic Co. of America.

Detector Check Valve (4" larger)

Ames DCV-1000

Febco Model 850

Wilkins Model 310 gl

Note: (substitute a springloaded swing check valve with testable outlets provided when using a 3" or less alarm valve assembly).

Fire-Protection-Service Valves:

Central Sprinkler Corp.

Grinnell Corp.

McWane, Inc.; Kennedy Valve Div.

Nibco, Inc.

Stockham Valves & Fittings, Inc.

Victaulic Co. of America.

Keyed Couplings for Steel Piping:

Grinnell Corp.

Victaulic Co. of America

Gustin Bacon, Gruvlok.

Ward, Couplox

Central, Sprink

Press-Seal Fittings for Steel Piping:

(not allowed)

Piping Materials:

Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

Pipes and Tubes:

Ductile-Iron Pipe: AWWA C151, mechanical-joint type; with cement-mortar lining and seal coat according to AWWA C104. Include gland, rubber gasket, and bolts and nuts according to AWWA C111.

Standard-Weight Steel Pipe: ASTM A 53, ASTM A 135, or ASTM A 795; Schedule 40 in NPS 6 and smaller, and Schedule 30 in NPS 8 and larger.

Thinwall, Threadable Steel Pipe: ASTM A 135 or ASTM A 795, with wall thickness less than Schedule 40 and greater than Schedule 10, (Dyna-Thread 40).

Schedule 10 Steel Pipe: ASTM A 135 or ASTM A 795, Schedule 10 in NPS 5 and smaller and NFPA 13 specified wall thickness in NPS 6 to NPS 10. (DynaFlow-10) (Not Allowed)

Thinwall Steel Pipe: ASTM A 135 or ASTM A 795, threadable, with nonstandard OD and wall thickness less than Schedule 10. (Not allowed)

Hybrid Steel Pipe: ASTM A 135 or ASTM A 795, lightwall, with wall thickness less than Schedule 10 and greater than Schedule 5. (Not allowed).

Pipe And Tube Fittings:

Ductile-Iron Fittings: AWWA C110, ductile-iron or cast-iron type; or AWWA C153, ductile-iron, compact mechanical-joint type. Include cement-mortar lining and seal coat according to AWWA C104 and glands, rubber gaskets, and bolts and nuts according to AWWA C111.

Cast-Iron Threaded Flanges: ASME B16.1.

Cast-Iron Threaded Fittings: ASME B16.4.

Steel, Threaded Couplings: ASTM A 865.

Steel Welding Fittings: ASTM A 234/A 234M, ASME B16.9, or ASME B16.11.

Steel Flanges and Flanged Fittings: ASME B16.5.

Steel, Grooved-End Fittings: UL-listed and FM-approved, ASTM A 47, malleable iron or ASTM A 536, ductile iron; with dimensions matching steel pipe and ends factory grooved according to AWWA C606.

Joining Materials:

Refer to Division 15 Section "Basic Mechanical Materials and Methods" for pipe-flange gasket materials and welding filler metals.

Ductile-Iron, Flanged Joints: AWWA C115, ductile-iron or gray-iron pipe flanges, rubber gaskets, and steel bolts and nuts.

Steel, Keyed Couplings: UL 213 and AWWA C606, for steel-pipe dimensions. Include ASTM A 536, ductile-iron housing, rubber gaskets, and steel bolts and nuts. Include listing for dry-pipe service for couplings for dry piping.

Transition Couplings: AWWA C219, sleeve type, or other manufactured fitting the same size as, with pressure rating at least equal to, and with ends compatible with piping to be joined.

Polyethylene Encasement:

Polyethylene encasement for Ductile-Iron Piping: ASTM A 674 or AWWA C105, film, 0.008-inch minimum thickness, tube or sheet. Note: Grease ferrous underground materials prior to installing encasement.

General-duty Valves:

Refer to Division 15 Section "Valves" for gate, ball, butterfly, globe, and check valves not required to be UL listed and FM approved.

Fire Protection Service Valves:

General: UL listed and FM approved, with minimum 175-psig nonshock working-pressure rating. Valves for grooved-end piping may be furnished with grooved ends instead of type of ends specified.

Gate Valves, NPS 2 and Smaller: UL 262; cast-bronze, threaded ends; solid wedge; OS&Y; and rising stem.

Indicating Valves, NPS 6" and Smaller: UL 1091; butterfly or ball-type, and integral indicating device.

Indicator: Electrical prewired, supervisory switch. Coordinate voltage and number of circuits with Fire Alarm requirements.

Gate Valves, NPS 2-1/2 and Larger: UL 262, iron body, bronze mounted, taper wedge, OS&Y, and rising stem. Include replaceable, bronze, wedge facing rings and flanged ends.

Swing Check Valves, NPS 2 and Smaller: UL 312 or MSS SP-80, Class 150; bronze body with bronze disc and threaded ends.

Swing Check Valves, NPS 2-1/2 and Larger: UL 312, cast-iron body and bolted cap, with bronze disc or cast-iron disc with bronze-disc ring and flanged ends or grooved ends.

Detector Check Valve, NPS 4" and larger: Resilient seated, spring loaded with testable outlets provided, as required by authorities having jurisdiction.

Specialty Valves:

Alarm Check Valves: UL 193, 175-psig working pressure; designed for horizontal or vertical installation, with cast-iron flanged inlet and outlet, bronze grooved seat with O-ring seals, and single-hinge pin and latch design. Include trim sets for bypass, drain, electric sprinkler alarm switch, pressure gages, retarding chamber, and fill-line attachment with strainer.

Option: Grooved-end connections for use with keyed couplings.

Drip Cup Assembly: Pipe drain without valves, and separate from main drain piping.

Ball Drip Valves: UL 1726, automatic drain valve, NPS 3/4, ball check device with threaded ends.

Sprinklers:

Automatic Sprinklers: With heat-responsive element complying with the following:

UL 199, for applications except residential.

UL 1626, for residential applications.

UL 1767, for early suppression, fast-response applications.
NFPA #13, 1996 ed.

Sprinkler Types and Categories: Nominal 1/2-inch orifice for "Ordinary" temperature classification rating, unless otherwise indicated or required by application.

Sprinkler types, features, and options include the following:

- Pendent sprinklers.
- Pendent, dry-type sprinklers.
- Quick-response sprinklers.
- Recessed sprinklers, including escutcheon.
- Sidewall sprinklers.
- Sidewall, dry-type sprinklers.
- Upright sprinklers.

Sprinkler Finishes: Chrome-plated, bronze, and painted.

Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers.

- Ceiling Mounting: white steel, one piece, flat.
- Ceiling Mounting: white steel, two piece, with 1-inch vertical adjustment.
- Sidewall Mounting: white steel, one piece, flat.

Sprinkler Guards: Wire-cage type, including fastening device for attaching to sprinkler.

Specialty Sprinkler Fittings:

Specialty Fittings: UL listed and FM approved; made of steel, ductile iron, or other materials compatible with piping.

Dry-Pipe-System Fittings: UL listed for dry-pipe service.

Locking-Lug Fittings: (not allowed).

Mechanical-T Fittings: (not allowed).

Mechanical-Cross Fittings: (not allowed).

Drop-Nipple Fittings: UL 1474, with threaded inlet, threaded outlet, and seals; adjustable.

Fire Department Connections:

Wall, Fire Department Connections: UL 405; cast-brass body with brass, wall, escutcheon plate; brass, lugged caps with gaskets and brass chains; and brass, lugged swivel connections. Include inlets with threads according to NFPA 1963 and matching local fire department sizes and threads, outlet with pipe threads,

extension pipe nipples, check devices or clappers for inlets, and escutcheon plate with marking "AUTO-SPRINKLER FIRE DEPARTMENT CONNECTION." Number of NPS 2-1/2 connections and size of outlet as indicated. (4 X 2 1/2 x 2 1/2)

Type: Projected, Siameze mounting
Escutcheon Plate: Round
Finish: Rough chrome

Alarm Devices:

General: Types matching piping and equipment connections.

Water-Motor-Operated Alarms: UL 753, mechanical-operation type with pelton-wheel operator with shaft length, bearings, and sleeve to suit wall construction and 10-inch- diameter, cast-aluminum alarm gong with red-enamel factory finish. Include NPS 3/4 inlet and NPS 1 drain connections.

Water-Flow Indicators: UL 346; electrical-supervision, vane-type water-flow detector; with 250-psig pressure rating; and designed for horizontal or vertical installation. Include two single-pole, double-throw, circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.

Valve Supervisory Switches: UL 753; electrical; single-pole, double throw; with normally closed contacts. Include design that signals controlled valve is in other than fully open position.

Pressure Gages:

Pressure Gages: UL 393, 3-1/2- to 4-1/2-inch- diameter dial with dial range of 0 to 250 psig.

EXECUTION:

Preparation:

Obtain Engineer's Water Analysis or fire-hydrant flow test. Use results for system design calculations required in "Quality Assurance" Article in Part 1 of this Section.

Earthwork:

Refer to Division 2 Section "Earthwork" for excavating, trenching, and backfilling.

Examination:

Examine roughing-in for piping to verify actual locations of piping connections before installation.

Proceed with installation only after unsatisfactory conditions have been corrected.

Coordination:

All work of this contractor will be coordinated with other trades to insure minimal changes to the sprinkler system from the designs. Careful coordination of mechanical and electrical ducts, pipe and conduit shall be required.

The ceiling cavity must be carefully reviewed and coordinated with all trades. In the event of conflict, the installation of the mechanical equipment and piping shall be in the following order: plumbing waste, rainwater, and soil lines; supply, return, and exhaust ductwork, water piping, fire protection piping; and pneumatic control piping.

All piping shall be run concealed where possible. All lines will be run as high as possible so as to not interfere with future changes to ceiling heights or other mechanical equipment. This contractor will be responsible for all sleeves, core drills, and sealing of penetrations in walls, floors, and structural members to facilitate the installation of the system, however, no holes in structural members will be allowed unless approved by the structural engineer.

Piping Applications:

Flanges, unions, and transition and special fittings with pressure ratings the same as or higher than system's pressure rating may be used in aboveground applications, unless otherwise indicated.

Piping between Fire Department Connections and Check Valves: Use galvanized, standard-weight steel pipe with grooved ends; steel, grooved-end fittings; steel, keyed couplings; and grooved joints.

Underground Service-Entrance Piping: Use mechanical-joint pipe and fittings and restrained joints. Grease ferrous materials and wrap with polyethylene encasement.

Sprinkler Main Piping: Use the following:

NPS 8 and Smaller: Steel pipe with threaded ends, or grooved ends. No plain ends allowed.
Outlets shall be welded, Mech. tee fittings are not allowed.

WET-PIPE Branch line piping: Use the following:

NPS 2 and Smaller: Threadable steel pipe with threaded ends; cast- or malleable-iron threaded fittings; and threaded joints. (Mech. Tee fittings are not allowed)

Valve Applications:

Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

Fire-Protection-Service Valves: UL listed and FM approved for applications where required by NFPA 13 and NFPA 14.

General-Duty Valves: For applications where UL-listed and FM-approved valves are not required by NFPA 13 and NFPA 14.

- a. Shutoff Duty: Use gate, ball, or butterfly valves.
- b. Throttling Duty: Use globe, ball, or butterfly valves.

Joint Construction:

Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping joint construction.

Ductile-Iron-Piping, Grooved Joints: Use ductile-iron pipe with radius-cut-grooved ends; ductile-iron, grooved-end fittings; and ductile-iron, keyed couplings. Assemble joints with couplings, gaskets, lubricant, and bolts according to coupling manufacturer's written instructions.

Steel-Piping, Grooved Joints: Use Schedule 40 steel pipe with cut or roll-grooved ends and Schedule 30 or thinner steel pipe with roll-grooved ends; steel, grooved-end fittings; and steel, keyed couplings. Assemble joints with couplings, gaskets, lubricant, and bolts according to coupling manufacturer's written instructions. Use gaskets listed for dry-pipe service for dry piping.

Water-supply Connection:

Install shutoff valve, check valve, pressure gage, drain, and other accessories at connection to water service.

Piping Installation:

Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping installation.

Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.

Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.

Install underground service-entrance piping according to NFPA 24 and with restrained joints.

Make connections between underground and above-ground piping using bolted flange.

Install mechanical sleeve seal at pipe penetrations in basement and foundation walls. Refer to Division 15 Section "Basic Mechanical Materials and Methods."

Use approved fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

Install unions adjacent to each valve in pipes NPS 2 and smaller. Unions are not required on flanged devices or in piping installations using grooved joints.

Install "Inspector's Test Connections" in sprinkler piping, complete with shutoff valve, sized and located according to NFPA 13.

Install sprinkler piping with drains for complete system drainage.

2 Install ball drip valves to drain piping between fire department connections and check valves. Drain to floor
drain or outside building.

4 Install alarm devices in piping systems.

6 Hangers and Supports: Comply with NFPA 13 for hanger materials. Install according to NFPA 13 for
sprinkler piping and to NFPA 14 for standpipes.

8 No powder driven studs allowed.

10 Wrap-around braces are to be provided at end of branch lines.

12 Specialty Sprinkler Fitting Installation:

14 Install specialty sprinkler fittings according to manufacturer's written instructions.

16 Valve Installation:

18 Refer to Division 15 Section "Valves" for installing general-duty valves. Install fire-protection specialty
valves, trim, fittings, controls, and specialties according to NFPA 13 and NFPA 14, manufacturer's written
20 instructions, and authorities having jurisdiction.

22 Valves: Install fire-protection-service valves supervised-open, located to control sources of water supply
except from fire department connections. Provide permanent identification signs indicating portion of system
24 controlled by each valve.

26 Alarm Check Valves: Install valves in vertical or horizontal position for proper direction of flow, including
bypass check valve and retard chamber drain-line connection. Install valve trim in accordance with the valve
28 manufacturer's appropriate trim diagrams. Install main drain to exterior.

30 Sprinkler Applications:

32 General: Sprinkler heads shall be of the latest design closed spray type for 155°F unless specified otherwise
or required by code. Heads in Light Hazard Occupancies shall be quick response type. Heads shall be a
34 minimum orifice size of 1/2". Extended coverage heads shall not be used. Orifices larger than 1/2" may be
used as required by density and spacing demands when specified. Use sprinklers according to the following
36 applications:

38 Rooms without Ceilings:

40 Upright and/or pendent sprinklers. Provide mechanical guards on all heads at or below 7'-0" height
above the floor or where damage from room occupant use may occur.

42 Rooms with Ceilings:

44 Recessed sprinklers.

46 Wall Mounting:

Sidewall sprinklers with recessed escutcheon.

Spaces Subject to Freezing:

Upright; pendent, dry-type; and sidewall, dry-type sprinklers.

Provide freeze proof type automatic sprinkler heads serving exterior canopy area, unconditioned spaces, areas subject to freezing and in other areas requiring their use.

Heads located within the air streams of unit heaters or other heat-emitting equipment shall be selected for proper temperature rating.

Sprinkler Finishes: Use sprinklers with the following finishes:

Upright, Pendent, and Sidewall Sprinklers: Chrome painted in finished spaces exposed to view; rough bronze in unfinished spaces not exposed to view.

Recessed Sprinklers: Bright white with bright white escutcheon.

Sprinklers: Use the following:

All sprinklers shall be listed, quick response type.

Sprinklers in basement storage areas shall be pendants/uprights installed with 1 x ½" bushing, to accommodate future finishes.

Finish ceiling spaces shall have recessed-type canopies.

Sprinkler Installation:

Every effort shall be required to insure that the heads form a symmetrical pattern in the ceiling with the ceiling grid, lights, diffusers and grilles. Offsets shall be made in piping to accommodate ductwork in the ceiling. Heads should be symmetrical and all piping run parallel or perpendicular to building lines.

In no case shall sprinkler heads be installed closer than approved distances from ceiling obstructions and HVAC ductwork.

Sprinkler heads shall not conflict with tile grids.

Sprinkler heads shall be located near center of corridors.

Where layout of sprinkler heads is shown on reflected ceiling plans the locations shall be followed unless approval is obtained from the Architect or such locations shown do not meet the requirements of NFPA-13. In either case, approval of the Architect shall be obtained in writing before sprinkler head locations are changed. If the installation of additional heads are needed to conform to NFPA 13 requirements in areas where heads are shown on reflected ceiling plans, they shall be included in the contract price.

Do not install pendent or sidewall, wet-type sprinklers in areas subject to freezing. Use dry-type sprinklers with water supply from heated space.

Connections:

Install ball drip valves at each check valve for fire department connection. Drain to floor drain or outside building.

Connect piping to specialty valves, hose valves, specialties, fire department connections, and accessories.

Electrical Connections: Power wiring is specified in Division 16.

Connect alarm devices to fire alarm.

Labeling and Identification:

Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13 and NFPA 14.

Field Quality Control:

Flush, test, and inspect sprinkler piping according to NFPA 13, "System Acceptance" Chapter.

Replace piping system components that do not pass test procedures and retest to demonstrate compliance. Repeat procedure until satisfactory results are obtained.

Report test results promptly and in writing to Architect and authorities having jurisdiction.

Whether the underground serving the sprinkler system is done by this contractor or another, this contractor will be responsible to assure and have in his possession a certificate that the underground has been flushed and tested by the contractor who installed it in accordance with NFPA-24 prior to connection of the underground piping to the overhead sprinkler system.

Cleaning:

Clean dirt and debris from sprinklers.

Remove and replace sprinklers having paint other than factory finish.

Protection:

Protect sprinklers from damage until Substantial Completion.

Commissioning:

Verify that specialty valves, trim, fittings, controls, and accessories are installed and operate correctly.

Verify that specified tests of piping are complete and that "Material Test Certificates" are complete.

2 Verify that damaged sprinklers and sprinklers with paint or coating not specified are replaced with new, correct type.

4 Verify that sprinklers are correct types, have correct finishes and temperature ratings, and have guards as required for each application.

6 Verify that fire department connections have threads compatible with local fire department equipment.

8 Fill wet-pipe sprinkler piping with water.

10 Coordinate with fire alarm tests. Operate as required.

12 Demonstration & Tests:

14 Demonstrate equipment, specialties, and accessories. Review operating and maintenance information.

16 All tests will be conducted as required by the local authority having jurisdiction, and in no case less than
18 those required by NFPA standards. As a minimum, piping in the sprinkler system shall be tested at a water
20 pressure at 200 psi for a period of not less two hours, or at 50 psi in excess of the normal pressure when the
22 normal pressure is above 150 psi. Bracing shall be in place, and air shall be removed from the system
through the hydrants and drain valves before the test pressure is applied. No apparent leaks will be permitted
on interior or underground piping.

24 The local jurisdiction having authority and the Utah State Fire Marshal's office (where required) shall be
26 notified at least three working days in advance of all tests and flushing. This includes any flushing of
undergrounds, hydrostatic testing, or flow testing that may be required.

28 This contractor shall make all the required tests to the sprinkler system as required by code. He shall be
30 responsible to assure that the Contractor Test Certificates for the overhead and underground work are
completed and delivered to the owner's insurance underwriter to assure proper insurance credit.

32 All tests requiring the witnessing by local authorities will be the responsibility of this contractor. If tests are
34 not run or do not have the proper witness, then they will be run later and all damage caused by the system,
or caused in uncovering the system for such test, will be borne by this contractor.

36 Warranty:

38 This contractor shall warranty the sprinkler system and all its components for one year from the date of
40 acceptance by the owner. Any costs incurred to extend any warranties of materials to assure this time frame
shall be borne by this contractor.

42 Field Quality Control:

44 Flush, test and inspect sprinkler piping according to NFPA 13, "System Acceptance" Chapter.

46 Replace piping system components that do not pass test procedures and retest to demonstrate compliance.
Repeat procedure until satisfactory results are obtained.

Report test results promptly and in writing to Architect and authorities having jurisdiction.

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6 END OF SECTION

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SECTION 15550 - BREECHINGS, CHIMNEYS, AND STACKS

0.1 SUMMARY

- A. Listed double-wall vents.

0.2 QUALITY ASSURANCE

- A. Welding Standard: AWS D1.1.

0.3 WARRANTY

- A. Materials and Workmanship for Venting Systems: 10 15 25 years.

0.4 PRODUCTS

- A. Listed Type L Vents: Double-wall metal vents.
 - 1. Inner Shell: Stainless steel.
 - 2. Outer Jacket: Galvanized Aluminized Stainless steel.
 - 3. Termination: Stack cap Round chimney top Exit cone with drain section incorporated into riser.
- B. Guying and Bracing: Galvanized, stranded wire cable pipe angle iron.

END OF SECTION 15550

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SECTION 15642 - CLOSED-CIRCUIT, MECHANICAL-DRAFT COOLING TOWERS

0.1 SUMMARY

- A. Factory-assembled and -tested, closed-circuit, forced-draft cooling towers.

0.2 QUALITY ASSURANCE

- A. Quality Standard: ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

0.3 WARRANTY

- A. Materials and Workmanship: Five years.

0.4 MATERIALS

- A. Casing Material: Galvanized sheet steel.
- B. Collection Basin Material: Galvanized sheet steel.
- C. Drain Connection: Bottom.
- D. Tube Bundle Material and Construction: Cleanable carbon-steel tubes, hot-dip galvanized .
- E. Drift-Eliminator Material: PVC.
- F. Water Distribution System: Schedule 40, PVC pipe and plastic, brass, or ceramic nozzles.
- G. Inlet Screen Material: Stainless-steel mesh mounted in removable frames.
- H. Draft Hood Material: Galvanized steel.

0.5 COMPONENTS

- A. Water-Level Control: Mechanical makeup water valve.
- B. Fan: Galvanized steel, propeller or Cast aluminum, propeller or Galvanized steel, centrifugal.
 - 1. Drive: Direct or belt.
 - 2. Vibration cutout switch.

- C. External-Circuit Circulating Pump: Centrifugal, close coupled, end suction, bronze fitted, with mechanical seals.
- D. Capacity-control dampers.
- E. Motors:
 - 1. Enclosure Type: Open, dripproof.
 - 2. Motor Speed: Single speed.

0.6 INSTALLATION

- A. Vibration Isolation: Rubber pads.

0.7 FIELD QUALITY CONTROL

- A. Testing Procedures: CTI's Supplement to ATC 105, "Acceptance Test Code for Closed Circuit Cooling Towers."

END OF SECTION 15642

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SECTION 15745 - WATER-SOURCE HEAT PUMPS

0.1 SUMMARY

- A. Factory-fabricated and -tested, horizontal and vertical water-source heat pumps.

0.2 SYSTEM PERFORMANCE

- A. Working Pressure: 400 psig (2760 kPa).

0.3 QUALITY ASSURANCE

- A. Quality Standard: ASHRAE 15 or ASHRAE 90.1.
- B. Safety Requirements: UL 559.

0.4 WARRANTY

- A. Materials and Workmanship: Five years.

0.5 COMPONENTS

- A. Concealed Horizontal and Vertical Units:
 - 1. Cabinet: Galvanized steel, with 1/2-inch (13-mm) glass-fiber insulation.
 - 2. Evaporator Fans: Direct driven, centrifugal.
 - 3. Refrigerant-to-Water Heat Exchanger: Coaxial.
 - 4. Refrigerant-to-Air Heat Exchanger: Copper-tube coil.
 - 5. Reversing valve.
 - 6. Compressor: Hermetic, with high-temperature cutouts, low-temperature cutouts, compressor motor overload protection, and capability to reset compressor lockout circuit at either remote thermostat or circuit breaker.
 - 7. Insulated copper refrigerant piping.
 - 8. Filters: Glass-fiber, throwaway type.
 - 9. Dampers: Motorized, outside-air dampers with manual override switch.
 - 10. Lubricating lines and hose kit.

0.6 COMMISSIONING

- A. Startup services.

B. Functional performance tests.

END OF SECTION 15745

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SECTION 15785 - AIR-TO-AIR ENERGY RECOVERY UNITS

0.1 SUMMARY

- A. Heat wheels.
- B. Fixed-plate heat exchangers.
- C. Packaged energy recovery units.

0.2 QUALITY ASSURANCE

- A. Standard for Capacity Ratings: ASHRAE 84.

0.3 PRODUCTS

- A. Heat Wheels: Steel casing with integral purge section, corrugated aluminum, glass-fiber or polymer rotor with nontoxic, noncorrosive silica-gel desiccant coating, and fractional horsepower motor with variable-frequency controller.
 - 1. Controls: Factory-mounted relay.
 - 2. Rotation detection.
- B. Fixed-Plate Heat Exchangers: Galvanized-steel casing.
 - 1. Plates: Embossed aluminum, Stainless steel, Polypropylene copolymer (plastic) or Proprietary-resin composite.
 - 2. Accessories:
 - a. Filter: Disposable or Electrostatic.
- C. Packaged Energy Recovery Units: Corrosion-protection coated, weathertight housing, with hinged access doors, inlet hood, and roof curb.
 - 1. Heat Recovery Device: Heat wheel or fixed-plate heat exchanger.
 - 2. Supply and Exhaust Fans: Forward-curved centrifugal fan, with belt-driven motor.
 - 3. Disposable filters.

END OF SECTION 15785

SECTION 15815 - METAL DUCTS

0.1 SUMMARY

- A. Metal ducts for supply, return, outside, and exhaust air-distribution systems in pressure classes from **minus 2- to plus 10-inch wg** and including the following:
 - 1. Rectangular ducts and fittings.
 - 2. Single-wall, round, and flat-oval spiral-seam ducts and formed fittings.
 - 3. Double-wall, round, and flat-oval spiral-seam ducts and formed fittings.
 - 4. Duct liner.

0.2 QUALITY ASSURANCE

- A. Quality Standard: SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."
- B. Installation Standards: NFPA 90A and NFPA 90B.
- C. Range Hood Duct Standard: NFPA 96.
- D. Mockups for system pressure classifications higher than **2-inch wg**.

0.3 MATERIALS

- A. Duct Materials:
 - 1. Galvanized sheet steel.
 - 2. PVC-coated galvanized steel.
 - 3. Carbon-steel sheets.
 - 4. Stainless steel.
 - 5. Aluminum sheets.
- B. Duct Liner: Fibrous glass.
- C. Sealant Materials: Joint and seam tape Tape sealing system Water-based joint and seam sealant Solvent-based joint and seam sealant Flanged joint mastic Flange gaskets.
- D. Hangers and Supports:
 - 1. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners.
 - 2. Hanger Materials: Galvanized sheet steel or threaded steel rod.
 - 3. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws.
 - 4. Trapeze and Riser Supports: Galvanized steel Stainless steel Aluminum.

0.4 APPLICATIONS

A. Static-Pressure Classes:

1. Supply Ducts: 1-inch wg 2-inch wg Insert pressure class.
2. Supply Ducts (before Air Terminal Units): 2-inch wg 3-inch wg.
3. Supply Ducts (after Air Terminal Units): 1-inch wg.
4. Supply Ducts (in Mechanical Equipment Rooms): 2-inch wg 3-inch wg.
5. Return Ducts (Negative Pressure): ½-inch wg 1-inch wg.
6. Exhaust Ducts (Negative Pressure): 1-inch wg 2-inch wg.

B. Duct Material: Galvanized steel.

C. Cleaning: New system.

0.5 FIELD QUALITY CONTROL

A. Leakage tests for duct that are higher than 3-inch wg class.

END OF SECTION 15815

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SECTION 15820 - DUCT ACCESSORIES

0.1 SUMMARY

- A. Dampers, silencers, turning vanes, duct-mounted access doors, and flexible ducts and connectors.

0.2 QUALITY ASSURANCE

- A. Installation Standards: NFPA 90A and NFPA 90B.

0.3 PRODUCTS

- A. Backdraft Dampers: Multiple, center-pivoted blade, parallel action, gravity balanced.
 - 1. Frames: Galvanized steel Extruded aluminum, with mounting flange.
 - 2. Blades: Roll-formed aluminum Aluminum sheet.
 - 3. Blade Seals: Felt Vinyl Neoprene.
 - 4. Blade Axles: Nonferrous Galvanized steel.
 - 5. Tie Bars and Brackets: Aluminum Galvanized steel.
 - 6. Return spring.
- B. Standard Volume Dampers: Multiple- or single-blade, parallel- or opposed-blade design, with linkage outside airstream.
 - 1. Frames: Galvanized steel Stainless steel Aluminum.
 - 2. Blades: Galvanized steel Stainless steel Aluminum sheet Extruded aluminum.
 - 3. Blade Axles: Galvanized steel Stainless steel Nonferrous.
 - 4. Tie Bars and Brackets: Aluminum Galvanized steel.
- C. Low-Leakage Volume Dampers: Multiple- or single-blade, parallel- or opposed-blade design, with linkage outside airstream.
 - 1. Frames: Galvanized steel Stainless steel Aluminum.
 - 2. Blades: Galvanized steel Stainless steel Aluminum sheet Extruded aluminum.
 - 3. Blade Axles: Galvanized steel Stainless steel Nonferrous.
 - 4. Bearings: Oil-impregnated bronze Molded synthetic Stainless-steel sleeve thrust or ball.
 - 5. Blade Seals: Felt Vinyl Neoprene.
 - 6. Jamb Seals: Cambered stainless steel aluminum.
 - 7. Tie Bars and Brackets: Aluminum Galvanized steel.
- D. Motorized Control Dampers: AMCA-rated, parallel opposed-blade design.
 - 1. Frames and Blades: Galvanized steel.
 - 2. Blade Edging: Closed-cell neoprene Inflatable or replaceable rubber.

- E. Fire Dampers: UL labeled.
 - 1. Fire Rating: 1-1/2 3 hours.
 - 2. Frame: Curtain type with blades inside airstream Curtain type with blades outside airstream Multiple-blade type; galvanized.
 - 3. Blades: Galvanized.
 - 4. Fusible Links: Replaceable, 165 deg F 212 deg F rated.
- F. Ceiling Fire Dampers: UL labeled.
 - 1. Galvanized-steel frame and blades.
 - 2. Fusible Links: Replaceable, 165 deg F 212 deg F 285 deg F rated.
- G. Smoke Combination Fire and Smoke Dampers: UL labeled.
 - 1. Fusible Links: Replaceable, 165 deg F 212 deg F rated.
 - 2. Frame and Blades: Galvanized steel.
 - 3. Damper Motors: Spring Nonspring return.
- H. Duct Silencers: Factory fabricated and tested, round or rectangular.
 - 1. Outer and Interior Casing: G90 G60 galvanized sheet steel.
 - 2. Fill Material: Fibrous Nonfibrous.
- I. Manufactured Turning Vanes: Single Double-blade, galvanized sheet steel.
- J. Acoustical Turning Vanes: Aluminum extrusions.
- K. Duct-Mounting Access Doors: Double wall, rectangular and round, galvanized sheet steel with 1 inch of insulation.
- L. Pressure Relief Access Doors: Single wall Double wall with insulation fill, and duct mounting.
- M. Flexible Connectors: UL 181, Class 1 and including the following types:
 - 1. Metal-Edged: Fabric strip 3-1/2 inches 5-3/4 inches wide.
 - 2. Indoor system, flexible connector fabric.
 - 3. Outdoor system, weatherproof, flexible connector fabric.
 - 4. High-temperature system, flexible connectors.
 - 5. High-corrosive-environment system, flexible connectors.
- N. Flexible Ducts: UL 181, Class 1.
 - 1. Noninsulated-Duct Connectors:
 - a. Helically wound, spring-steel wire with vinyl film polymer film multiple layers of aluminum laminate and aluminum laminate and polyester film.
 - b. Interlocking spiral of aluminum foil.

2. Insulated-Duct Connectors:

- a. Helically wound, spring-steel wire with vinyl film polymer film multiple layers of aluminum laminate and aluminum laminate and polyester film, and fibrous-glass insulation, with polyethylene aluminum vapor barrier.
- b. Interlocking spiral of aluminum foil, and fibrous-glass insulation, with polyethylene aluminum vapor barrier.

END OF SECTION 15820

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SECTION 15838 - POWER VENTILATORS

0.1 SUMMARY

A. Power Ventilators:

1. Utility fan sets.
2. Centrifugal roof ventilators.
3. Upblast propeller roof exhaust fans.
4. Centifugal wall ventilators.
5. Ceiling-mounting ventilators.

0.2 QUALITY ASSURANCE

A. Performance Requirements: AMCA-Certified Ratings Seal.

0.3 MANUFACTURED UNITS

A. Utility Set Fans: Belt-driven, centrifugal type, with housing, wheel, motor, and drive assembly.

1. Housing: Galvanized steel, adjustable to eight standard positions.
2. Fan Wheel: Single width, single inlet, backward inclined, steel backward inclined, aluminum forward curved, steel forward curved, aluminum.
3. Fan Shaft: Steel.
4. Shaft Bearings: Prelubricated and sealed with 200,000-hour rated life.
5. Belt Drives: Factory mounted and field adjustable.
 - a. Service Factor: 1.5 1.4 1.3 1.2.
 - b. Motor Pulleys: Adjustable pitch for motors up through 5 hp and fixed pitch for motors larger than 5 hp.
6. Accessories:
 - a. Backdraft dampers.
 - b. Access doors.
 - c. Scroll dampers.
 - d. Inlet screens.
 - e. Drain connections.
 - f. Weather hoods.

B. Centrifugal Roof Ventilators: Belt-driven or direct-driven centrifugal type, with housing, wheel, motor, drive assembly, and curb base.

1. Housing: Removable, spun aluminum.
2. Fan Wheels: Aluminum with backward-inclined blades.

3. Belt-Driven Drive Assembly: Steel shaft, permanently lubricated and sealed bearings, and cast-iron adjustable-pitch pulley.
 4. Accessories:
 - a. Variable-speed controller.
 - b. Disconnect switch.
 - c. Bird screens.
 - d. Backdraft dampers.
 - e. Motorized dampers.
 5. Roof Curbs: Galvanized steel; self-flashing without cant strip and with mounting flange .
 - a. Overall Height: 8 inches 9-1/2 inches 12 inches 16 inches 18 inches.
- C. Axial Roof Ventilators: Belt-driven or direct-driven axial type, with housing, wheel, motor, drive assembly, and curb base.
1. Housing: Removable, spun aluminum.
 2. Fan Wheel: Aluminum Steel.
 3. Belt-Driven Drive Assembly: Steel shaft, permanently lubricated and sealed bearings, and cast-iron adjustable-pitch pulley.
 4. Accessories:
 - a. Disconnect switch.
 - b. Bird screens.
 - c. Backdraft dampers.
 - d. Motorized dampers.
 5. Roof Curbs: Galvanized steel; self-flashing without cant strip and with mounting flange built-in cant and mounting flange built-in raised cant and mounting flange.
 - a. Overall Height: 8 inches 9-1/2 inches 12 inches 16 inches 18 inches.
- D. Upblast Propeller Roof Exhaust Fans: Belt-driven or direct-driven propeller type, with housing, wheel, butterfly-type discharge damper, motor, drive assembly, and curb base.
1. Wind Band, Fan Housing, and Base: Reinforced and braced galvanized steel aluminum.
 2. Fan Wheel: Replaceable, cast extruded-aluminum, airfoil blades.
 3. Belt-Driven Drive Assembly: Steel shaft, prelubricated and sealed bearings, and cast-iron adjustable-pitch pulley, with motor mounted outside the airstream.
 4. Roof Curbs: Galvanized steel; self-flashing without cant strip and with mounting flange built-in cant and mounting flange built-in raised cant and mounting flange.
 - a. Overall Height: 8 inches 9-1/2 inches 12 inches 16 inches 18 inches.
 - b. Options: Sound insulation Burlar bars.
- E. Centrifugal Wall Ventilators: Belt-driven or direct-driven centrifugal type, with housing, wheel, motor, and drive assembly.

1. Housing: Removable, spun aluminum.
2. Fan Wheel: Aluminum with backward-inclined blades.
3. Belt-Driven Drive Assembly: Steel shaft, permanently lubricated and sealed bearings, cast-iron adjustable-pitch pulley, with fan and motor isolated from airstream.
4. Accessories:
 - a. Variable-speed controller.
 - b. Disconnect switch.
 - c. Bird screens.
 - d. Wall grille.
 - e. Backdraft dampers.
 - f. Motorized dampers.

F. Ceiling-Mounting Ventilators:

1. Housing: Steel with acoustical insulation.
2. Fan Wheels: Centrifugal.
3. Grilles: Plastic Stainless steel, louvered.
4. Accessories:
 - a. Variable-speed controller.
 - b. Manual starter switch.
 - c. Time-delay switch.
 - d. Motion sensor.
 - e. Ceiling radiation damper.
 - f. Washable filter.
 - g. Vibration isolators.
 - h. Roof jack or wall cap and transition fittings.

G. In-Line Centrifugal Fans: In-line, centrifugal type, with housing, wheel, outlet guide vanes, motor, and drive assembly.

1. Housing: Split, spun aluminum.
2. Direct-Driven Units: Motor encased in housing outside of airstream.
3. Belt-Driven Units: Motor mounted on adjustable base.
4. Fan Wheels: Aluminum.
5. Accessories:
 - a. Volume-control damper.
 - b. Companion flanges.
 - c. Fan guards.
 - d. Motor and drive cover (belt guard).

H. Propeller Fans: Belt-driven or direct-driven propeller type, with housing, orifice ring, motor, and drive assembly.

1. Housing: Galvanized steel.

2. Fan Wheels: Steel Cast aluminum Extruded aluminum.
3. Belt-Driven Drive Assembly: Steel shaft, prelubricated and sealed bearings.
 - a. Motor Pulleys: Adjustable pitch for motors up through 5 hp and fixed pitch for motors larger than 5 hp.
4. Accessories:
 - a. Gravity shutters.
 - b. Motor-side back guard.
 - c. Wall sleeve.
 - d. Weathershield hood.
 - e. Weathershield front guard.
 - f. Variable-speed controller.
 - g. Disconnect switch.

I. Motors: NEMA MG 1, continuous duty.

1. Enclosure: Open Guarded dripproof.

0.4 SOURCE QUALITY CONTROL

- A. Sound-Power Level Ratings: Tested according to AMCA 300.
- B. Fan Performance Ratings: Tested and rated according to AMCA 210.

0.5 INSTALLATION

- A. Ceiling Units: Suspended from structure.
- B. Suspended Units: Supported using threaded steel rods and spring isolators.

END OF SECTION 15838

SECTION 15840 - AIR TERMINAL UNITS

0.1 SUMMARY

- A. Shutoff single-duct air terminal units.

0.2 QUALITY ASSURANCE

- A. Installation Standard: NFPA 90A.

0.3 PRODUCTS

- A. Shutoff Single-Duct Air Terminal Units:

1. Configuration: Volume damper assembly inside unit casing.
2. Casing: Steel Aluminum with removable access panels.
 - a. Casing Lining: ~~1/2-inch-~~ ~~3/4-inch-~~ ~~1-inch-~~ thick, coated, fibrous-glass duct liner. Liner covered with nonporous foil. Liner covered with nonporous foil and perforated metal.
3. Regulator Assembly: Aluminum or steel, automatic flow-control assembly System-air-powered bellows.
4. Volume Damper: Galvanized steel with maximum airflow leakage of 2 3 percent ~~3-inch wg~~ ~~6-inch wg~~.
 - a. Damper Position: Normally open closed.
5. Attenuator Section: Steel Aluminum, internally insulated.
 - a. Lining: ~~1/2-inch-~~ ~~3/4-inch-~~ ~~1-inch-~~ thick, coated, fibrous-glass duct liner. Liner covered with nonporous foil. Liner covered with nonporous foil and perforated metal.

0.4 SOURCE QUALITY CONTROL

- A. Air terminal units rated according to ARI 880.

END OF SECTION 15840

SECTION 15855 - DIFFUSERS, REGISTERS, AND GRILLES

0.1 SUMMARY

- A. Ceiling- and wall-mounted diffusers, registers, and grilles.

0.2 PRODUCTS

A. Adjustable Bar Grille Register:

1. Material: Steel Aluminum Stainless steel.
2. Face Blade Arrangement: Fixed horizontal Adjustable horizontal Fixed vertical Adjustable vertical.
3. Rear Blade Arrangement: Fixed horizontal Adjustable horizontal Fixed vertical Adjustable vertical.
4. Mounting Frame: Filter Insert frame size and style.
5. Mounting: Countersunk screw Concealed Lay in.
6. Damper Type: Adjustable opposed-blade assembly Opposed blade with spring-closing and UL-listed fusible link.
7. Accessories: Front Rear-blade gang operator.

B. Security Grille Register:

1. Material: Steel Aluminum.
2. Face Arrangement: **Front lattice plate** Perforated faceplate Bars and mandrel tubes and rods Bars and double mandrel tubes.
3. Wall sleeve.
4. Mounting: Retaining angle Cast-in-place frame.
5. Damper Type: Adjustable opposed-blade assembly Opposed blade with spring-closing and UL-listed fusible link.

C. Fixed Face Grille Register:

1. Material: Steel Aluminum.
2. Face Arrangement: **1/2-by-1/2-by-1/2-inch** grid Perforated core.
3. Mounting Frame: Filter Insert frame size and style.
4. Mounting: Countersunk screw Concealed Lay in.
5. Damper Type: Adjustable opposed-blade assembly Opposed blade with spring-closing and UL-listed fusible link.

D. Linear Bar Grille or Diffuser:

1. Material: Steel Aluminum Stainless steel.
2. Narrow Core Spacing Arrangement: **1/8-inch**- thick blades, zero 15-degree deflection.
3. Wide Core Spacing Arrangement: **1/8-inch**- thick blades, zero 15-degree deflection.
4. Wide Core Spacing Arrangement: **3/16-inch**- thick blades, zero 15 30-degree deflection.

5. Pencil-Proof Core Spacing Arrangement: **3/16-inch-** thick blades, zero 15 30-degree deflection.
6. One Two-Way Deflection Vanes: Extruded construction fixed louvers with removable core.
7. Mounting Frame: Filter Insert frame size and style.
8. Mounting: Countersunk screw Concealed bracket Spring clip.
9. Damper Type: Adjustable opposed-blade assembly Hinged single blade.
10. Accessories: Plaster frame Directional vanes Alignment pins Core clips Blank-off strips.

E. Linear Slot Diffuser:

1. Material - Shell: Steel Aluminum, insulated noninsulated.
2. Material - Pattern Controller and Tees: Aluminum.
3. Slot Width: **½ inch ¾ inch 1 inch 1-1/2 inches.**
4. Number of Slots: One Two Three Four Insert number.
5. Length: **24 inches 30 inches 36 inches 48 inches 60 inches.**
6. Accessories: Plaster frame T-bar slot Center notch T-bar on inlet side T-bar on both sides T-bar clip on one side T-bar clips on both sides.

F. Round Ceiling Diffuser:

1. Material: Steel Aluminum.
2. Finish: Baked enamel Anodized aluminum Insert finish.
3. Face Style: Four Three Two cone.
4. Pattern: Fully adjustable Two position horizontal.
5. Dampers: Radial opposed blade Butterfly Combination damper and grid.
6. Accessories:
 - a. Equaling grid.
 - b. Plaster ring.
 - c. Safety chain.
 - d. Wire guard.
 - e. Sectorizing baffles.
 - f. Operating rod extension.

G. Rectangular and Square Ceiling Diffusers:

1. Material: Steel Aluminum.
2. Finish: Baked enamel Anodized aluminum Insert finish.
3. Face Size: **24 by 24 inches 20 by 20 inches 12 by 12 inches** Insert size.
4. Face Style: Three cone Four cone Plaque.
5. Mounting: Surface T-bar Snap in Spline Mounting panel.
6. Pattern: Fixed Two position Adjustable.
7. Dampers: Radial opposed blade Butterfly Combination damper and grid.
8. Accessories:
 - a. Equaling grid.
 - b. Plaster ring.
 - c. Safety chain.

- d. Wire guard.
- e. Sectorizing baffles.
- f. Operating rod extension.

H. Perforated Diffuser:

- 1. Material: Steel backpan and pattern controllers, with steel aluminum face.
- 2. Finish: Baked enamel Anodized aluminum Insert finish.
- 3. Face Size: 12 by 12 inches 24 by 12 inches 36 by 12 inches 48 by 12 inches 16 by 16 inches 20 by 20 inches 24 by 24 inches 36 by 24 inches 48 by 24 inches Insert size.
- 4. Face Style: Flush Drop extended.
- 5. Pattern Controller: Four louvered deflector patches Fixed with curved blades at inlet Adjustable with louvered pattern modules at inlet None.
- 6. Mounting: Surface T-bar Snap in Spline Mounting panel.
- 7. Dampers: Opposed blade Radial opposed blade Butterfly Combination damper and grid Combination volume and fire.
- 8. Accessories:
 - a. Equaling grid.
 - b. Plaster ring.
 - c. Safety chain.
 - d. Wire guard.
 - e. Sectorizing baffles.
 - f. Operating rod extension.

I. Louver Face Diffuser:

- 1. Material: Steel Aluminum.
- 2. Finish: Baked enamel Anodized aluminum Insert finish.
- 3. Face Size: Insert inches.
- 4. Mounting: Surface Surface with beveled frame T-bar Snap in Spline Mounting panel.

0.3 SOURCE QUALITY CONTROL

- A. Tested for performance according to ASHRAE 70.

END OF SECTION 15855

SECTION 15900 - HVAC INSTRUMENTATION AND CONTROLS

0.1 SUMMARY

Control equipment for HVAC systems and components.

The ATC Control System shall be a micro processor DDC System.

System
other
operating
control mechanical systems.

QUALITY ASSURANCE

Quality Standard: ASHRAE 135 for DDC system control components (BACnet compatible).

COMPONENTS

DDC Equipment:

Operator Station: Microcomputer station with printer.

Workstation: IBM-compatible microcomputer supporting BACnet devices.

Printer: Dot-matrix Color, ink-jet type.

Application Software: With dynamic color graphic displays, alarm processing, event

5. random-access
local operator access and display panel; integral interface equipment; and backup
6. Control Units: Modular processor board with electronically programmable,
7. Capacity for minimum 10 workstations connected to multiuser, multitasking
8.
 - a.
 - b.
 - c.
 - d.

B.

- 1.
- 2.
- 3.

HVAC INSTRUMENTATION AND CONTROLS

C. Analog Controllers:

1. 6- or 10-stage-type step controllers.
2. Remote-bulb or bimetal, rod-and-tube-type, electric outdoor reset controllers.
3. Wheatstone-bridge-amplifier electronic controllers.
4. Solid-state fan-speed controllers.
5. Single- or dual-input receiver controllers.

D. Actuators:

1. Electric motors.
2. Electronic damper large-valve actuators.
3. Pneumatic valve and damper operators.
4. Pneumatic damper operators.

E. Control Valves:

1. Globe Valves: Bronze body for **NPS 2** and smaller; iron body for **NPS 2-1/2** and larger.
2. Butterfly Valves: Cast-iron or ductile-iron body.
3. Terminal Unit Control Valves: Bronze body.

F. Dampers: AMCA rated, parallel opposed-blade design, for standard and low-leak applications.

G. Air Supply:

1. Control and Instrumentation Tubing: Seamless copper Virgin polyethylene, flame retardant, nonmetallic.
2. Tank: ASME storage tank.
3. Air Compressor: Duplex Simplex.
4. Refrigerated air dryer.
5. Desiccant dryer.
6. Pressure gages.
7. Instrument pressure gages.
8. Diaphragm control and instrument valves.
9. Gage cocks.
10. Pressure regulators.
11. Particle filters.
12. Combination filter/regulators.
13. Airborne oil filters.
14. Pressure relief valves.
15. Pressure-reducing stations.

END OF SECTION 15900

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SECTION 15950 - TESTING, ADJUSTING, AND BALANCING

0.1 SUMMARY

- A. Testing, adjusting, and balancing for the following:
 - 1. Air Systems:
 - 2. Hydronic Systems:
 - 3. Motors.
 - 4. Chillers.
 - 5. Condensing units.
 - 6. Boilers.
 - 7. Heat-transfer coils.
 - 8. Temperature measurements.
 - 9. Space pressurization measurements and adjustments.
 - 10. Vibration measurements.
 - 11. Sound-level measurements.
 - 12. Smoke-control system testing.
 - 13. Indoor-air quality measurements.
 - 14. Existing systems.
 - 15. Temperature-control verification.

0.2 QUALITY ASSURANCE

- A. Testing, Adjusting, and Balancing Agent Qualifications: AABC NEBB certified.

0.3 WARRANTY

- A. Guarantee: AABC national project performance NEBB guarantee that a certified agent has performed TAB and optimum performance capabilities have been achieved.

0.4 EXECUTION

- A. Examination: Contract Documents, approved submittal data, Project Record Documents, design data, equipment performance data, system and equipment installations, systems and equipment test reports, and automatic controls for deficiencies that may preclude proper TAB of systems and equipment.
 - 1. Deficiencies report.
- B. Testing, adjusting, and balancing plan.
- C. Systems readiness checks.

- D. Testing, Adjusting, and Balancing Procedures: AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems." NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems." SMACNA's "HVAC Systems HVAC Systems - Testing, Adjusting, and Balancing."
- E. Equipment settings marked to show final settings.
- F. HVAC Systems Airflow and Water Flow Rate Tolerances:
 - 1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus 5 percent to plus 10 percent.
 - 2. Air Outlets and Inlets: 0 to minus 10 percent.
 - 3. Heating-Water Flow Rate: 0 to minus 10 percent.
 - 4. Cooling-Water Flow Rate: 0 to minus 5 percent.
- G. Reporting:
 - 1. Initial Construction-Phase Report: Based on examination of the Contract Documents, on adequacy of design for systems' balancing devices.
 - 2. Status Reports: As Work progresses.
 - 3. Final Report: Certification sheet with content and format according to AABC NEBB SMACNA standard forms.
- H. Inspections:
 - 1. Initial Inspections: Random checks by TAB firm to verify final TAB report.
 - 2. Final Inspections: Random checks by Owner to verify final TAB report.
- I. Additional Tests:
 - 1. Performed within 90 days to verify that balance conditions are being maintained.
 - 2. Seasonal tests.

END OF SECTION 15950

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Sound

Geothermal Corporation

435-722-5877
fax 435-722-5089



Wednesday, December 11, 2002

Mr. Lynn Hinrichs
State of Utah
Division of Facilities, Construction, and Management
4110 State Office Building
Salt Lake City, Utah 84114

RE: DFCM Project No. 02015430, Division of Youth Corrections, Washington County
Youth Center Geothermal Soil Analysis

Dear Mr. Hinrichs:

Enclosed is the drilling log and Thermal Conductivity Test Report for the above referenced project. Pursuant to our contract, one borehole was drilled and the formation thermal conductivity was tested at this site. The actual borehole site was moved about 150 feet east of the permitted location because of the topography. The enclosed map shows the approximate location of the existing borehole. The loop pipe above ground was elevated with a stake and painted with international orange construction paint.

Test Borehole #1 was drilled by Spence Bowman with Geo Energy Services, Kanarraville, Utah, using air and foam rotary. The borehole was drilled in just less than five hours. There were no problems while running the 1.25" loop pipe. We encountered water between 55 and 60 feet. There was a slight sulfur smell to the produced water. Water production while drilling was between 20 and 30 gallons per minute. The water production did not hinder drilling as long as a small amount of bio-degradable drilling soap was injected. Provided that there is not a problem with the produced water while drilling, this would most likely be the preferred method used to install the ground loop heat exchanger.

While running the grout pipe (tremie pipe), the driller encountered a bridge at 170 feet that prevented grouting from the bottom of the hole to surface. Since the Thermal Conductivity Test is not affected by the back-fill of the borehole, the driller was instructed to proceed with the grouting operation. Geothermal Resource Technologies was provided with a complete drilling log to enter the appropriate drilling and grouting information. This borehole was used to test the location thermal conductivity.

The results of the conductivity test on Borehole #1 show the following:

Formation Thermal Conductivity: 1.57 Btu/hr-ft-°F

Formation Thermal Diffusivity: 1.04 ft²/day

Undisturbed Earth Temperature: 68 – 72 °F

The thermal conductivity and diffusivity of the formation is relatively high with respect to other tests conducted in the area. The undisturbed earth temperature, on the other hand, is also higher than normal and will offset some of the benefit of the higher thermal conductivity. Based on the ease of drilling and the test information, we believe that this site is a good candidate for a closed loop ground source system or a hybrid fluid cooler/closed loop system.

Regards,

Cary Smith CGD

President

IGSHPA Installer #15163-397

IGSHPA Installation Trainer #T1095-398

AEE/CGD

enclosures



**Geothermal
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Technologies, Inc.**

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FORMATION THERMAL CONDUCTIVITY TEST AND DATA ANALYSIS

Analysis for:

**Sound Geothermal Corporation
Rt #3 Box 3010
Roosevelt, UT 84066
Phone: (435) 722-5877
Fax: (435) 722-5089**

Test location:

**Washington County Youth Center
St. George, Utah**

Report Date:

November 20, 2002

Test Performed by:

Sound Geothermal Corporation

Executive Summary

A formation thermal conductivity test was performed at the Washington County Youth Center site in St. George, Utah. The vertical bore was completed on November 9, 2002, by Geo Energy Systems. GRTI's test unit was attached to the vertical bore at noon on November 15, 2002. Geothermal Resource Technologies, Inc. analyzed the collected data using the "line source" method.

This report provides a general overview of the test and procedures that were used to perform the thermal conductivity test along with a plot of the data in real time and in a form used to calculate the formation thermal conductivity. The following average formation thermal conductivity was found from the data analysis.

⇒ Formation Thermal Conductivity = 1.57 Btu/hr-ft-°F

Due to the necessity of a thermal diffusivity value in the design calculation process, an attempt was made to estimate the average thermal diffusivity for the encountered formation.

⇒ Formation Thermal Diffusivity $\approx 1.04 \text{ ft}^2/\text{day}$

An estimate of the undisturbed soil temperature value was determined from the initial temperature data at startup.

⇒ Undisturbed Soil Temperature $\approx 68\text{-}72^\circ\text{F}$

A copy of the original collected data is available either in a hard copy or an electronic format upon request.

Test Procedures

The American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE) has recently adopted a set of standards for performing formation thermal conductivity tests for geothermal applications. GRTI is committed to adhering to the published specifications. Some of these standards are listed below:

- (1) Required Test Duration – A minimum test duration of 36 hours is recommended, with a preference toward 48 hours.
- (2) Power Quality – The standard deviation of the power should be $\leq 1.5\%$ of the average power, with maximum power variation of $\leq 10\%$ of the average power. The heat flux rate should be 51 Btu/hr (15 W) to 85 Btu/hr (25 W) per foot of borehole depth to best simulate the expected peak loads on the u-bend.
- (3) Undisturbed Soil Temperature Measurement – The undisturbed soil temperature should be determined by recording the minimum loop temperature as the water returns from the u-bend at test startup.
- (4) Installation Procedures for Test Loops – The bore diameter is to be no larger than 6 inches, with 4.5 inches being the target diameter. To ensure against bridging and voids, the bore annulus is to be uniformly grouted from the bottom to the top using a tremie pipe.
- (5) Time Between Loop Installation and Testing – A minimum delay of five days between loop installation and test startup is recommended if the formation is expected to have a low thermal conductivity or if low conductivity grouts (< 0.75 Btu/hr·ft·°F) are used. A minimum delay of three days is recommended for all other conditions.

GRTI's testing procedures deviate slightly from those above with regard to item (5). While item (5) bases the delay between installation and testing on the expected formation conductivity, GRTI bases its delay on the type of drilling used in the installation. When air drilling is required, a five-day delay is recommended to allow the bore to return to its undisturbed temperature. For mud rotary drilling, a minimum waiting period of two days is sufficient.

Data Analysis

Geothermal Resource Technologies, Inc. uses the "line source" method of data analysis. The line source equation used is not valid for early test times. Also, the line source method assumes an infinitely thin line source of heat in a continuous medium. If a u-bend grouted in a borehole is used to inject heat into the ground at a constant rate in order to determine the average formation thermal conductivity, the test must be run long enough to allow the finite dimensions of the u-bend pipes and the grout to become insignificant. Experience has shown that the amount of time required to allow early test time error and finite borehole dimension effects to become insignificant is approximately ten hours.

In order to analyze real data from a formation thermal conductivity test, the average temperature of the water entering and exiting the u-bend heat exchanger is plotted versus the natural log of time. Using the Method of Least Squares, the linear equation coefficients are then calculated that produce a line that fits the data. This procedure is normally repeated for various time intervals to ensure that variations in the power or other effects are not producing erroneous results.

Through the analysis process, the collected raw data is converted to spreadsheet format (Microsoft Excel®) for final analysis. A copy of this data can be obtained either in a hard copy or electronic copy format at any time. If desired, please contact Geothermal Resource Technologies, Inc. and provide a ship-to address or e-mail address at one of the following:

Phone: (972) 390-1537

Fax: (972) 390-1851

E-mail: askouby@grti.com

Formation Thermal Conductivity Test Report

Date November 15-17, 2002
Location St. George, Utah

Borehole Data

Mean Undisturbed Soil Temperature Approx. 68-72°F
Borehole Diameter 5.125 inches

Drill Log	Sandy clay and gravel	0'-25'
	Gray shale and clay	25'-120'
	Shale	120'-135'
	Sandstone and clay	135'-150'
	Shale	150'-152'
	Sandstone	152'-160'
	Shale and clay	160'-170'
	Shale	170'-182'
	Sandstone	182'-200'
	90% sandstone, 10% shale	200'-210'
	80% sandstone, 20% shale	210'-220'
	80% shale, 20% sandstone	220'-240'
	90% shale, 10% sandstone	240'-250'
	80% shale, 20% sandstone,	250'-260'
	90% shale, 10% sandstone	260'-280'
	90% sandstone, 10% shale	280'-290'
	Shale	290'-294'
	Clay	294'-298'

Note: 20-30 gpm water produced at 150 ft.

Depth to Water NA ft
U-bend Size 1.25 inch HDPE
U-Bend Length 298 ft
Grout Type GeoPro TG-88
Grouted Portion 0 – 170 ft
Grout Solids 63.0%

Test Data

Test Duration 44.3 hrs.
Average Voltage 237.9 V
Average Power 4,556 W
Total Heat Input Rate 15,549 Btu/hr
Calculated Circulator Flow Rate 8.7 gpm

Washington County Youth Center, St. George, UT
November 15-17, 2002

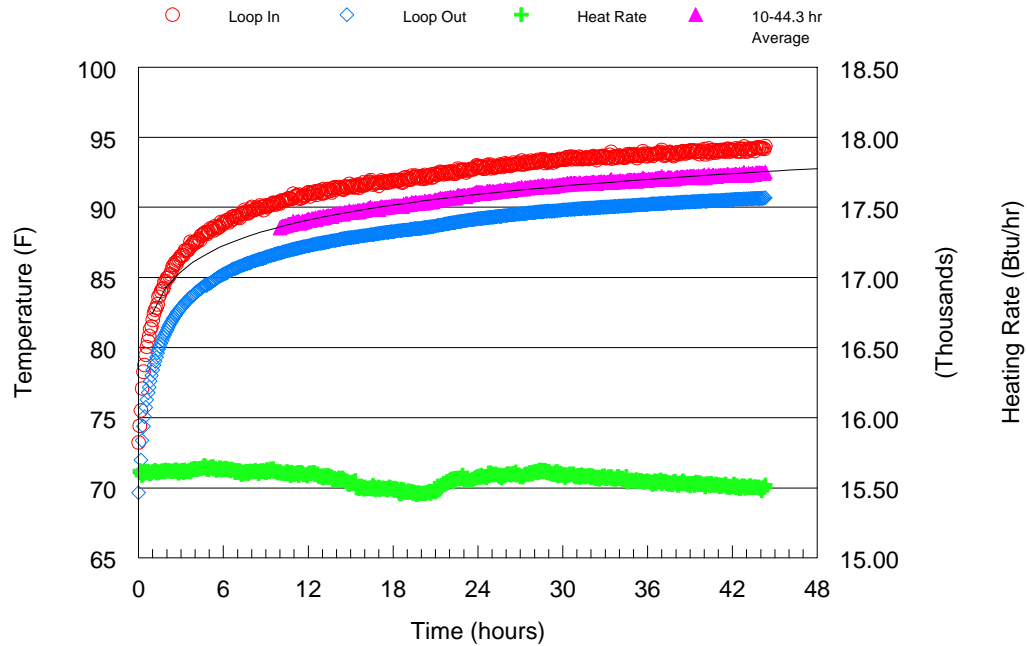


Figure 1: Temperature versus Time Data

Line Source Data Analysis

Washington County Youth Center, St. George, UT November 15-17, 2002

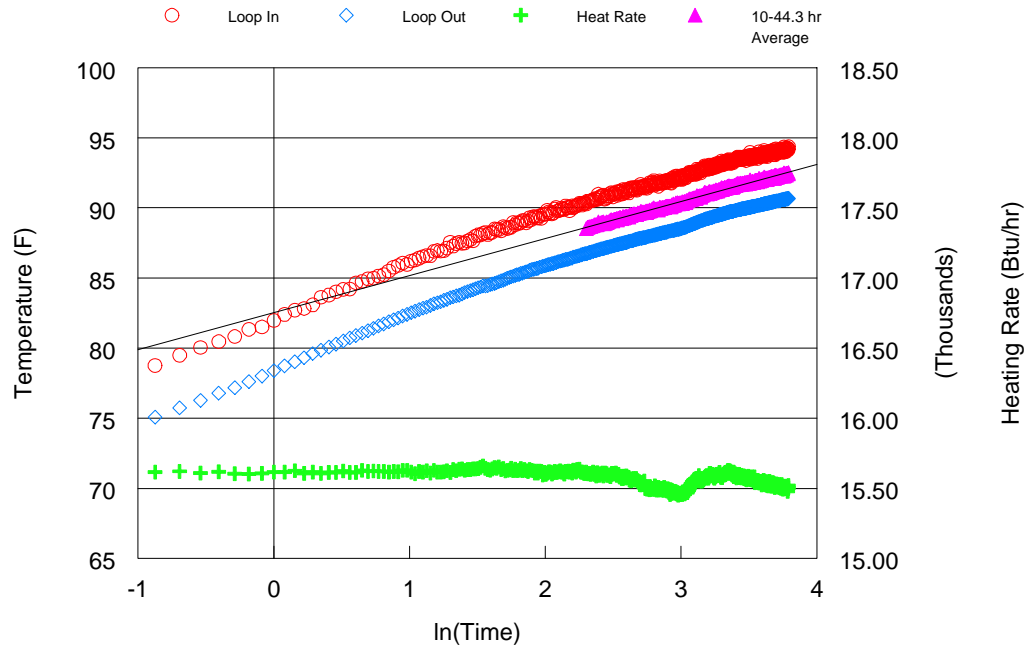


Figure 2: Temperature versus Natural Log of Time

Time Period	Slope: a_1	Average Heat Input (Btu/hr-ft)	W/ft)	Thermal Conductivity (Btu/hr-ft-°F)
10 – 44.3 hrs	2.64	52.18	15.29	1.57

The temperature versus time data was analyzed using the line source analysis for the time period shown above. An average linear curve fit was applied to the data between 10 and 44.3 hours. The slope of the curve (a_1) was found to be 2.64. The resulting thermal conductivity was found to be 1.57 Btu/hr-ft-°F.

Estimated Thermal Diffusivity

The reported drilling log for this test borehole indicated that the formation consisted mainly of sandstone, shale and clay. Heat capacity values were calculated from specific heat and density values listed by Kavanaugh and Rafferty (Ground-Source Heat Pumps - Design of Geothermal Systems for Commercial and Institutional Buildings, ASHRAE, 1997). A saturated moisture content was assumed for clay to produce a value for heat capacity. A weighted average of these values based on the indicated formation was used to develop an average heat capacity for the formation. An estimated diffusivity value was then found using the calculated formation thermal conductivity and the estimated heat capacity. The thermal diffusivity for this formation was estimated to be approximately 1.04 ft²/day.

Est. Average Heat Capacity (Btu/ft ³ °F)	Thermal Conductivity (Btu/hr-ft-°F)	Est. Thermal Diffusivity (ft ² /day)
36.15	1.57	1.04

Frequently Asked Questions (FAQ's) Regarding FTC Testing

- Q:** Thermally-enhanced grout is specified for the final loop field design. The test bore was grouted with a low conductivity, 20% solids, bentonite grout. How do I adjust the thermal conductivity value to account for this?
- A:** While the conductivity of the grout is important for the loop field design, it is not important for determining formation thermal conductivity. We use the “line source” method to analyze data, which assumes an infinitely thin line rejecting heat at a constant rate into an infinite medium. The initial ten hours, which is influenced by the bore dimensions and grout conductivity, is ignored in the analysis. However, once the heat has penetrated into the formation, the temperature rise of the formation approaches steady-state. It is the slope of the temperature rise that is used in the analysis. Hence, no adjustment to the reported formation thermal conductivity is required.
- Q:** The software I use to design the loop field requires that I input a value for “soil conductivity”. Is this the same as formation thermal conductivity?
- A:** Absolutely. Formation, soil, and ground are all used interchangeably to describe the conditions in which the u-bends will be installed. The use of the word “formation” simply implies that the installation conditions may be soil, rock, or some combination of the two.
- Q:** I’ve just received your report. I have a formation conductivity of 1.54 Btu/hr-ft-°F. How do I translate that into a loop length requirement, in terms of bore depth (in feet) per ton?
- A:** The formation thermal conductivity test provides values for three key parameters required for the ground loop design. These are the “Undisturbed Soil Temperature, Formation Thermal Conductivity, and Formation Thermal Diffusivity.” These parameters, along with many others, are inputs to commercially available loop design software (e.g. GchpCalc, available at GeoKiss.com/software). The software uses all of the inputs to determine the required loop length in bore depth per ton.
- Q:** Is the “Undisturbed Soil Temperature” value listed in the report the temperature that I enter into my loop design software where it calls for the “Deep-Earth Temperature”?
- A:** Generally, yes. The “Undisturbed Soil Temperature” is the constant temperature of the formation. We attempt to determine this value by measuring the temperature of the water entering the test unit at the beginning of the test. However, the value we measure and report may be inaccurate if the test is initiated too quickly after the installation of the test bore, or if the testing operator failed to activate the data acquisition unit prior to energizing the heating elements. If you suspect the temperature we are reporting to be too high or too low, we recommend that you investigate further through other sources.

[illegible]

DATE: _____
ST. GEORGE, UTAH
RUSH AND GUDGELL INC.

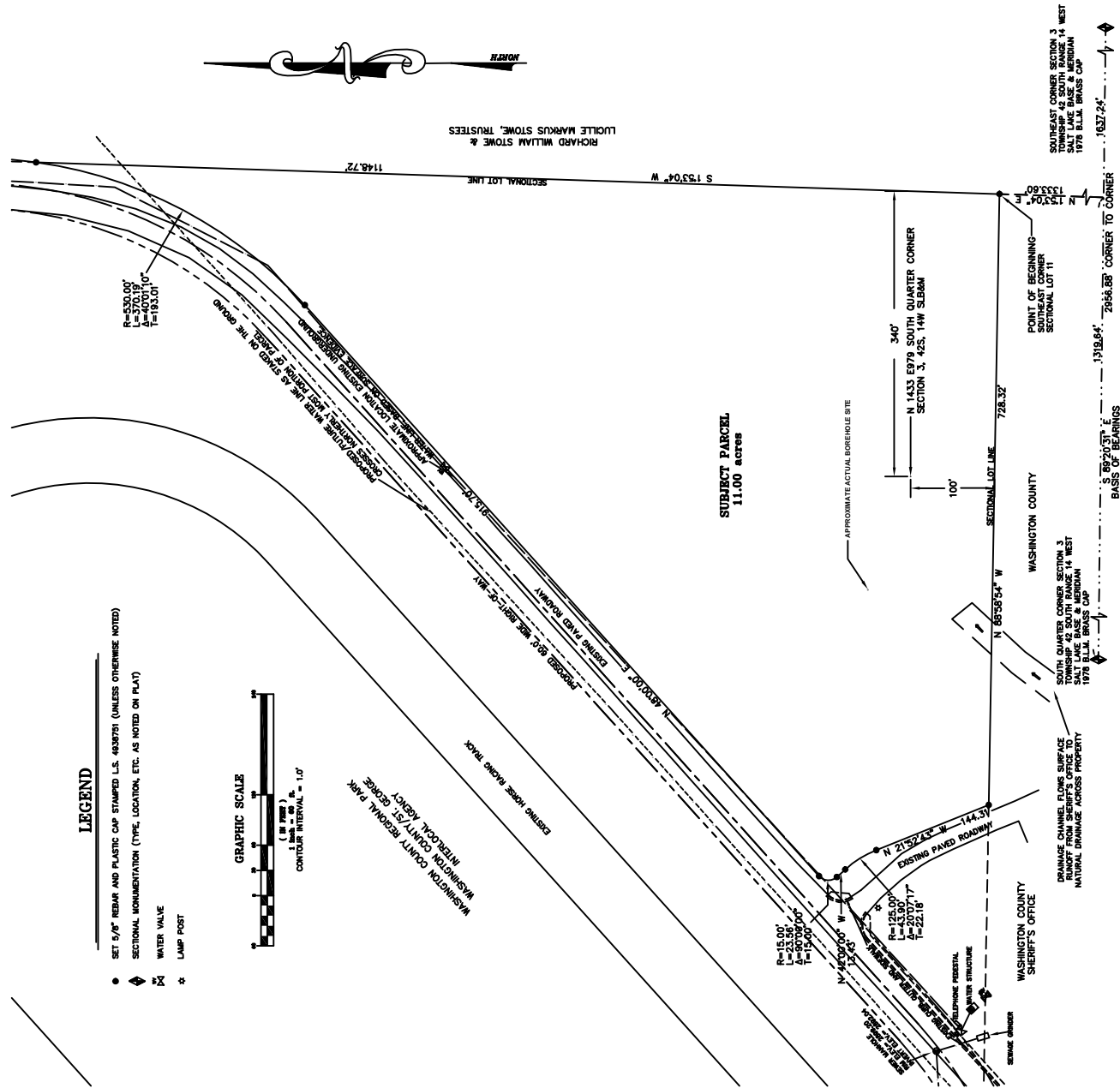


PARCEL OF LAND LOCATED IN SECTION 14, TOWNSHIP 43 SOUTH, RANGE 14 WEST, SALT LAKE BASIN AND BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

THE PURPOSE OF THIS SURVEY WAS TO PROVIDE INFORMATION CONSISTENT WITH THE REQUIREMENTS OF AN ALTA. SURVEY FOR THE ABOVE DESCRIBED PARCEL. THE BASIS OF BEARINGS FOR THIS SURVEY IS 3 TOWNSHIP 32 SOUTH, RANGE 14 WEST, RANGE 10 EAST, SECTION 36, TOWNSHIP 32 SOUTH, RANGE 14 WEST, RANGE 10 EAST, SECTION 36. THE COURSE OF THIS SURVEY IS NOTED ON THIS SURVEY. ALL MONUMENTATION USED OR SET BY THE COURSE OF THIS SURVEY IS NOTED ON THIS SURVEY. TESTING THROUGHOUT THE PARCEL SURROUND HAS NO KNOWLEDGE OF THE EXTENT OR RESULTS OF APPARENT TESTING.

EXCEPTIONS per SOUTHERN UTAH TILE COMPANY This Report File No. 101877, Effective date August 14, 2002 @ 7:00 AM. The estate or interest in the land described or referred to in this Commitment and covered herein is FEE SIMPLE. This to add estate or interest in said land is at the effective date hereof vested in WASHINGTON COUNTY/ST. GEORGE INTERLOCAL AGENCY. The land referred to in this Commitment is located in the County of WASHINGTON, State of UTAH.

- [illegible]



1637.24'

A.L.T.A. / A.C.S.M. LAND TITLE SURVEY

LOCATED IN
 SOUTHEAST 1/4 SECTION 3
 TOWNSHIP 42 SOUTH RANGE 1 WEST,
 SALT LAKE BASIN AND MERIDIAN
 PREPARED FOR:
 UTAH STATE D.P.C.M.

**DIVISION OF YOUTH CORRECTIONS
WASHINGTON COUNTY YOUTH CENTER
GEOTHERMAL SOIL ANALYSIS
DFCM Project No. 02015430**

**DRILLING LOG - Test Borehole #1
11/08-09/02**

Location: 1977' FEL 1433' FSL S-3, T-42S, R14W SLBM
Purgatory Flats, Washington County Utah

Driller: Geo Energy Systems, Spence Bowman
Utah License: '713
Rig: Falling SpeedStar SD-300
Drilling Fluid: Air mist w/ soap - Airlifted water
Loop: 1.25" loop
Grout: TG88
SPUD/TD 12:15 PM 11/8/02 11:40 AM 11/9/02
Spud with 5 1/8" medium tooth length button bit
Drill Pipe - 3.5" IF

NOTE: Time gaps represent connections or unrelated activity

Time Start	End	Activity	Duration Minutes	Depth	Comments
12:15	12:20	D	5	0-20	Tan sandy clay and gravel
12:20	12:25	D	5	20-25	Tan sandy clay and gravel
12:25	12:37	D	12	25-40	Soft gry sh and clay
12:37	12:42	D	5	40-50	Soft gry sh and clay
12:42	12:52	D	10	50-60	Soft gry sh and clay
12:52	13:15	D	23	60-80	Soft gry sh and clay
13:18	13:47	D	29	80-100	Soft gry sh and clay
13:47	14:15	D	28	100-120	Soft gry sh and clay, Trace (tr) Mauve sh
14:15	14:32	D	17	120-130	Med soft gry sh, 10% Drk red sh
14:32	14:38	D	6	130-136	Med soft gry sh, 30% Drk red sh
14:38	14:40	D	2	134-140	100% drk red ss and clay
14:40	14:50	D	10	140-150	100% drk red ss and clay
14:50	14:52	D	2	150-152	Water - 20-30 gpm gry sh
14:52	14:57	D	5	152-160	Med hard gry stringers w/ red ss
14:57	15:05	D	8	160-170	gry sh, 173' red sh and clay
15:05	15:17	D	12	170-180	med gry shale
15:17	15:19	D	2	180-182	med gry shale
15:19	15:32	D	13	182-200	drk red ss
15:32	16:00		0		Bit plugged @200' on connection
16:00	16:30		0		POOH - unplug bit, SDFN

11/9/02

8:15

9:00

						TIH and circulate every connection water @ 25', no fill on bottom NEW BIT: Medium mill tooth
9:07	9:16	D	9	200-210		90% dk red ss, 10% gry sh
9:16	9:26	D	10	210-220		80% dk red ss, 20% gry sh
9:30	9:42		0			Plugged bit POOH one jt - unplug
9:42	9:48	D	6	220-230		80% gry sh, 20% red ss
9:48	10:00	D	12	230-240		80% gry sh, 20% red ss
10:00	10:05		0			Blow hole to remove cuttings
10:05	10:15	D	10	240-250		90% gry sh, 10% red ss
10:15	10:23	D	8	250-260		60% dk red sh, 20% dk red ss, 20% gry sh
10:25	10:33	D	8	260-270		70% dk red sh, 10% dk red ss, 20% gry sh
10:33	10:45	D	12	270-280		70% dk red sh, 10% dk red ss, 20% gry sh
10:48	11:02	D	14	280-290		90% gry ss, 10% dk red sh
11:02	11:05	D	3	290-294		soft rd sh
11:05	11:07	D	2	294-300		soft rd clay - TD 300'
11:07	11:35		0			Circulate hole, POOH

Total Drilling Time:

288
4.80

Minutes
Hours
NOTE: All ss are very fine grained.

11:35 - 12:00

Circulate and condition hole. RIH w/ 1.25", DR-11 Phillips Unicoil to 298' - no fill.

Bit teeth OK but bearings shot.

Shut down for lunch and to pick up sand from St. George.

2:45 - 3:45 run tremie and grout. Tremie Pipe would not go past 170'.

0-170'

Grout borehole with 7 units of Thermal Grout 85, good returns. (50# Thermal-Lite/200 # silica sand
210 gallons of grout used.)

170-300

Formation Water

Bowen Grout unit with 1" HDPE tremie pipe.

TC Test - FTC #16, DA #14

Atlas Copco Generator, 60 kW, 239.8 vac

Start 11/15/02 @ 11:55 AM

End 11/17/02 - 8:00 AM

LEGEND

ss-sand stone

sh - shale

Tr - trace

POOH - Pull out of hole

br - brown

TD - Total Depth

RIH - Run in hole

rd- red

gry - gray

SDFN - Shut down for night